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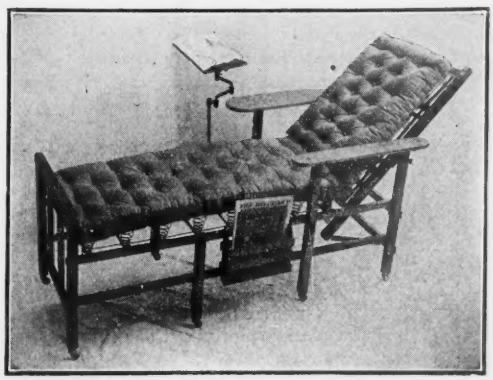

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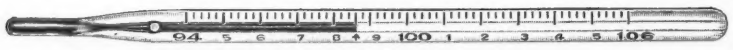

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A STUDY OF THE NERVES AND GANGLIA OF THE LUNG IN A CASE OF PULMONARY TUBERCULOSIS

WILLIAM SNOW MILLER

From the Anatomical Laboratory of the University of Wisconsin

It is not my purpose to describe in detail the distribution of the nerves and ganglia within the lung; but rather to describe them, with such anatomical detail as is necessary, as I have found them along the bronchi and connective tissue septa in a case of tuberculosis which Dr. H. K. Dunham of Cincinnati kindly placed at my disposal. While the account given here is from a tubercular lung, the distribution of the nerves and ganglia differ in no respect from the normal. Tuberculosis does not occasion an increase in the number of nerves or ganglia in the lung.

The history of the case shows that it was one of rapid tuberculosis occurring in a teamster, forty-seven years old, the duration of the disease being about seven months. While under observation at the Cincinnati Tuberculosis Sanatorium the amount of expectoration was recorded as three ounces a day; a sufficient quantity to be associated with the presence of cavities. Although cavities were present in the apex of the upper lobe of the left lung, it seems to me that there are other factors to be taken into consideration in accounting for the amount of expectoration, as will appear later.

The roentgenogram of the left lung showed that the walls of the bronchi of the lower lobe were uniformly thickened; serial sections were cut from blocks taken along the course of the main stem bronchus for the purpose of determining the cause of this thickening. When these sections came to be studied attention, however, was immediately directed to the condition of the nerves and ganglia.

For some time I have been familiar with the distribution of the nerves and ganglia in the normal lung, but this is the first opportunity I have had to make an extended study of them in a tubercular lung.

The lungs receive their nerve supply from the pneumogastric nerve reinforced by branches from the second, third, and sometimes the fourth

thoracic ganglia of the sympathetic. At the root of the lung, on either side, there is formed by these conjoined nerves the anterior and posterior pulmonary plexuses; of these the posterior is the larger. Branches which contain both medullated and non-medullated fibers are given off from these plexuses. These follow the bronchi throughout their course, diminishing in size with the diminishing calibre of the bronchi.

In transverse sections of large and medium sized bronchi three, and sometimes four nerve trunks can be seen situated external to the cartilages and usually associated with a branch of the bronchial artery. From these main trunks branches arise which form an anastomosing plexus which surrounds the bronchus in a manner similar to that by which the intestine is surrounded by the plexus myentericus and like the latter it possesses numerous ganglia (fig. 1).

From the plexus of bronchial nerves just described branches are given off which penetrate the groups of glands and eventually break up into small branches which are distributed to the various compartments of the gland. That these nerves eventually have the same relationship to the gland cells as is the case in other situations there is no reason to doubt. In many places not only these nerves but also the main nerve trunks are highly inflamed, being surrounded by and infiltrated with a large number of lymphocytes (fig. 2). Other branches from the bronchial plexus pass between the gland groups and eventually reach the smooth muscle in the wall of the bronchi. Some of the branches have ganglion cells scattered along their course (fig. 3).

The musculature of the bronchi is a direct continuation of the musculature of the trachea. Ploschko has shown that branches extend from the nerves and ganglia of the trachea and break up in a terminal arborization within the trachealis muscle. Berkley found, by the Golgi method, fibers which were distributed not only to the bronchial musculature but also to the epithelium of the bronchi; the source of these bronchial fibers must be the nerves above described. As is the case elsewhere, so here, the nerves are often surrounded by and infiltrated with a large number of lymphocytes.

Not only are nerves found associated with the bronchi but branches of the conjoined nerve also follow the pulmonary artery and vein, being situated in their adventitia (fig. 4) or, in the case of those branches of the pulmonary vein which are situated in the septa which surround the secondary lobules, in the connective tissue of the septa (fig. 5).

Along the course of the larger branches of the pulmonary artery, out-

side of the adventitia proper in the connective tissue between the artery and the adjoining air spaces, large nerve trunks accompanied by a branch of the bronchial artery are frequently found; these nerves as well as the bronchial artery are often surrounded by an area of lymphocytic infiltration. Branches are often given off from these nerves which can be followed a short distance into the parenchyma of the lung, but they are soon lost and their ending is uncertain.

Since the time of Remak the presence of ganglia and scattered ganglionic cells along the course of the nerves situated in the walls of the bronchi have been noted by various authors, but only incidentally. Serial sections of the main stem bronchus show that they are more numerous than generally supposed, for in a superficial count sixty ganglia were recognized in a series of 160 sections cut 50 micra thick; this does nor include the scattered cells seen along the course of the nerves. In a few sections two or more ganglia appear in a single field (fig. 6).

In some instances the ganglia are associated with the accompanying artery and nerve, being enclosed within a more or less distinct sheath of connective tissues. A few blood capillaries, an occasional lymph vessel and a small amount of adipose tissue are also enclosed within this sheath. Ganglia of this character are usually situated external to the cartilage (fig. 7).

In many sections ganglia were found within the glands (fig. 8); and it seems to me that the presence of nerves and ganglia in this situation has a very important bearing on the activity of the glands not only in the present instance but also in the normal lung. In a single instance the cells of a ganglion, situated within a gland, were found shrunken and the nuclei presented all the characteristic appearances associated with exhausted cells.

While there is no doubt that the nerves are distributed to the smooth muscle in the walls of the bronchi it is not usual to find a ganglion in close apposition to the muscle. One of the ganglia seen in figure 6, however, occupies such a position.

In the connective tissue surrounding the pulmonary artery and vein ganglia were found which were not associated with either system of blood vessels but were situated close to the walls of adjacent alveoli (fig. 9). In the connective tissue septa surrounding the secondary lobules ganglia are also present (fig. 10); these ganglia and their nerves are to be correlated with the branches of the bronchial artery and pulmonary vein found in this situation. In a few instances ganglia were found associated with

the lymph vessels of the bronchi and also with those accompanying the branches situated within the connective tissue septa (fig. 11). In all these situations ganglia were found surrounded by and infiltrated with lymphocytes, showing that they, as well as the nerves, were involved in the general inflammatory process (fig. 12).

Although many of these anatomical facts are quite generally known, they have been given but little consideration by anatomists, pathologists or clinicians; and so far as my knowledge goes, nerves and ganglia are scarcely mentioned in descriptions of the normal or pathological bronchi.

In the brief account of the roentgen findings the walls of the bronchi of the lower lobe were stated to be thickened. Sections taken from all of the blocks studied show that in the larger bronchi there is extensive exfoliation of the epithelium which is often collected into clumps which in some sections partially block the lumen of the bronchi; the lamina propria and the layer of smooth muscle are infiltrated with a large numver of lymphocytes. Many of the smaller bronchi present the characteristic picture of caseous tuberculous bronchitis.

A noticeable feature, however, is presented by the glands; their ducts are dilated and filled with exfoliated epithelium and a large number of lymphocytes; the stroma of the glands is also invaded by the lymphocytes and the glands are in a state of full activity. All of the cartilages are more or less calcified and the connective tissue is somewhat oedematous.

While many cases of chronic catarrhal bronchitis present a somewhat similar picture we must in the present instance designate it as a case of tuberculous bronchitis in which there is hypertrophy of the mucus membrane, a proliferation of the glands, oedema of the connective tissue and inflamed nerves and ganglia.

Several questions arise in connection with this study of the nerves and ganglia in a tubercular lung:

1. May not the increased activity of the glands be due to the irritation of the nerves and ganglia?

2. May not the irritating and productive cough in some cases of tuberculosis and the dry hacking cough in other cases be due to nerve irritation?

3. May not the nervous hyperaesthetic condition accompanied by very shallow breathing which is a frequent result of gas poisoning in the present war be due in some measure to irritation of this nervous apparatus of the lung?

I leave the answer to these questions in the hands of the physiologists and clinicians.

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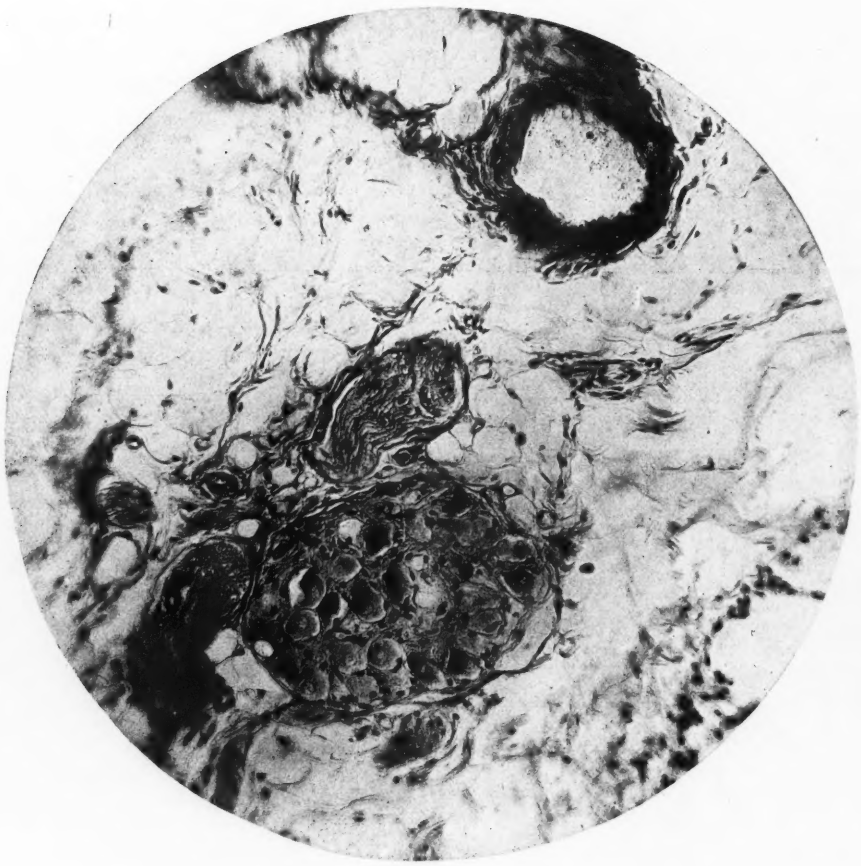

FIG. 1. NORMAL GANGLION

The ganglion lying in close apposition to the nerve, which at the plane of section was running in more or less of a spiral course, is well defined. Small branches of the main nerve can be seen on either side of the ganglion. The blood vessel seen in section in the upper portion of the photograph is the bronchial artery.

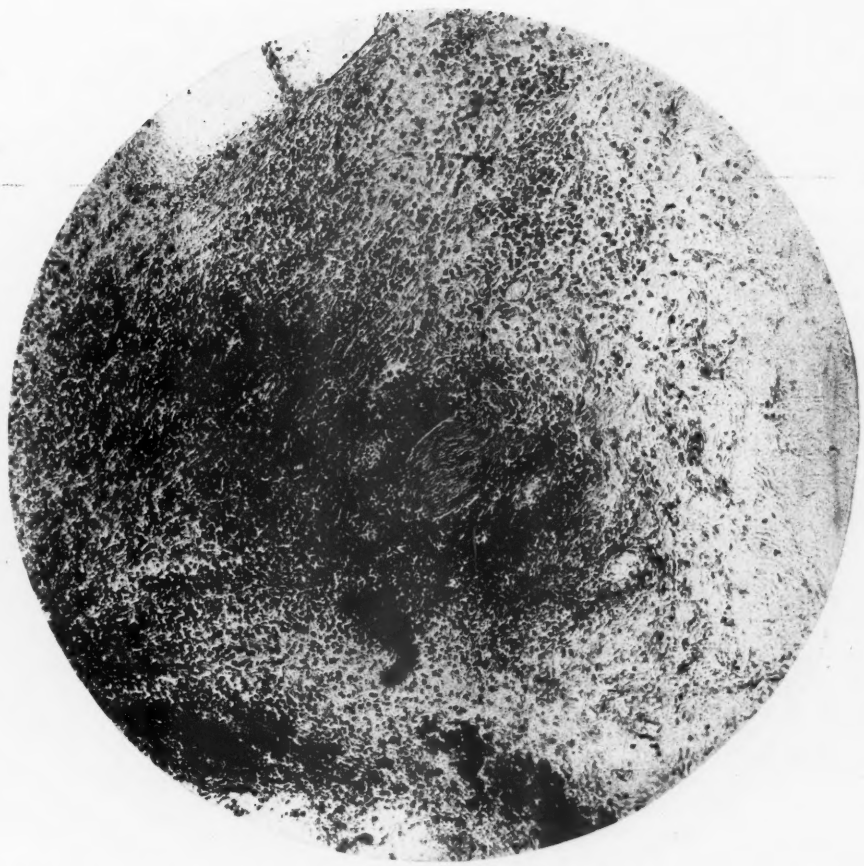

FIG. 2. A MAIN NERVE TRUNK SITUATED JUST OUTSIDE OF A GLAND GROUP SURROUNDED BY AND INFILTRATED WITH LYMPHOCYTES

FIG. 3. A SMALL NERVE CONTAINING A SINGLE NERVE CELL PASSING TO THE MUSCLE IN THE BRONCHIAL WALL

A portion of the musculature can be seen on the left side of the photograph. The indicator points to the nerve cell.

FIG. 4. LONGITUDINAL SECTION OF A BRANCH OF THE PULMONARY ARTERY

From the mid-zone region of the lower left lobe. The dark band of wavy fibers situated in the adventitia of the artery is the nerve cut longitudinally.

FIG. 5. SECTION THROUGH ONE OF THE SEPTA BETWEEN TWO SECONDARY LOBULES

In the lower left quadrant of the photograph the pulmonary vein is seen in section. The outermost of the group situated in the upper right quadrant is the bronchial artery; next to it a small venous radicle while the third member of the group is the nerve.

FIG. 6. TWO GANGLIA, THE LOWER OF WHICH IS SITUATED CLOSE TO THE MUSCULATURE OF THE BRONCHUS

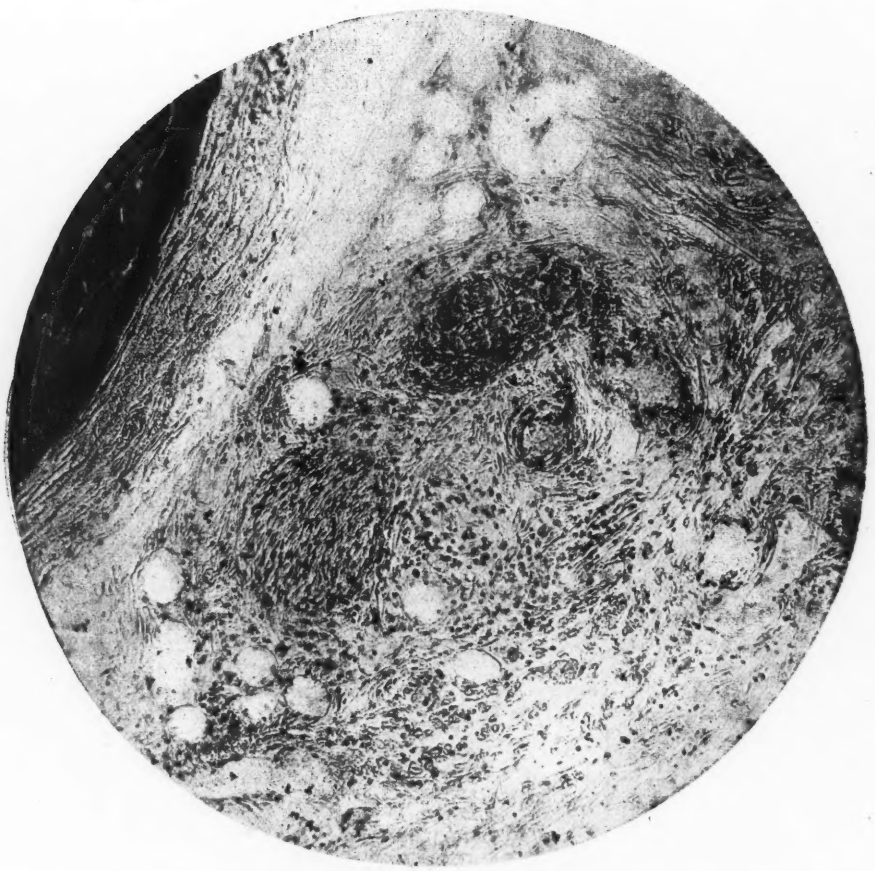

FIG. 7. GROUPING OF THE NERVE, GANGLION, AND BRONCHIAL ARTERY JUST OUTSIDE OF THE CARTILAGE A SMALL PORTION OF WHICH CAN BE SEEN AT THE EXTREME LEFT OF THE PHOTOGRAPH

The connective tissue sheath enclosing these structures is not as well defined in the photograph as in the section.

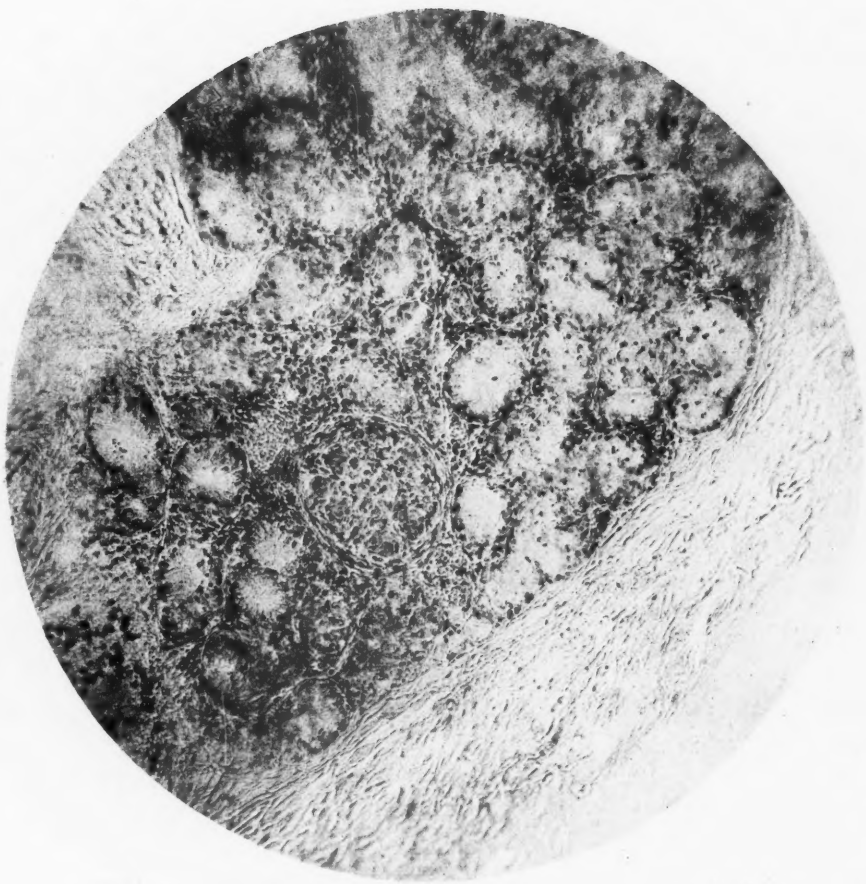

FIG. 8. SECTION SHOWING A SMALL GANGLION SITUATED WITHIN A GLAND

The gland and ganglion show that they are included in the general inflammatory process present in the wall of the bronchus.

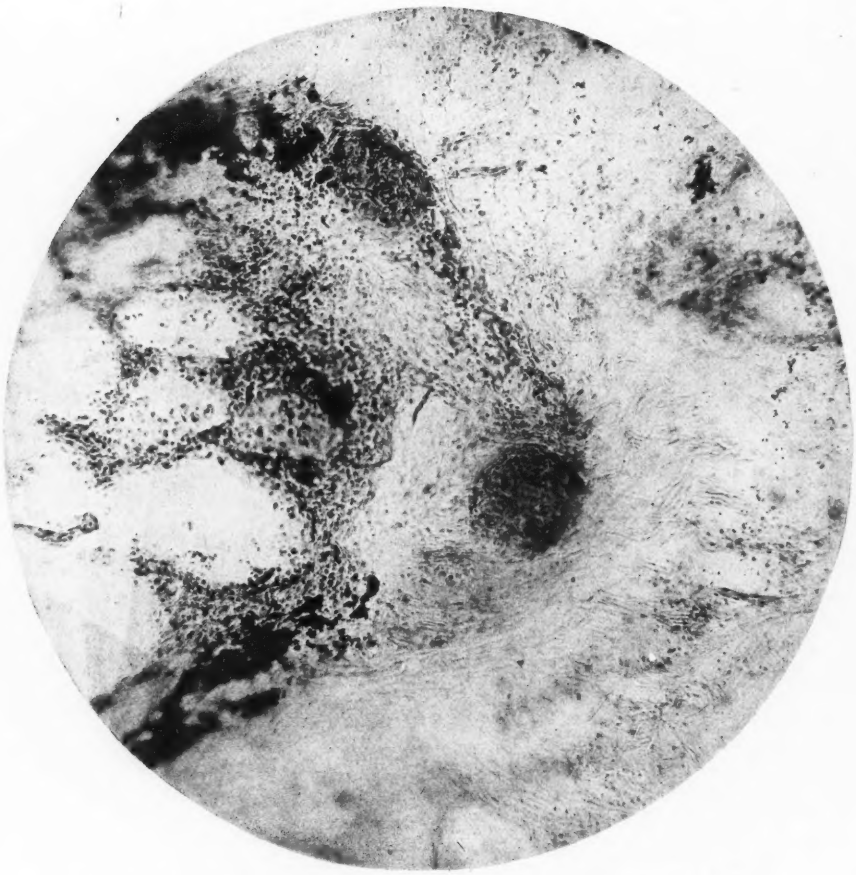

FIG. 9. TWO GANGLIA SITUATED CLOSE TO THE WALLS OF THE ALVEOLI. MARKED ANTHRACOSIS

FIG. 10. GANGLION IN A CONNECTIVE TISSUE SEPTUM

Situated between a branch of the bronchial artery and a small branch of the pulmonary vein.

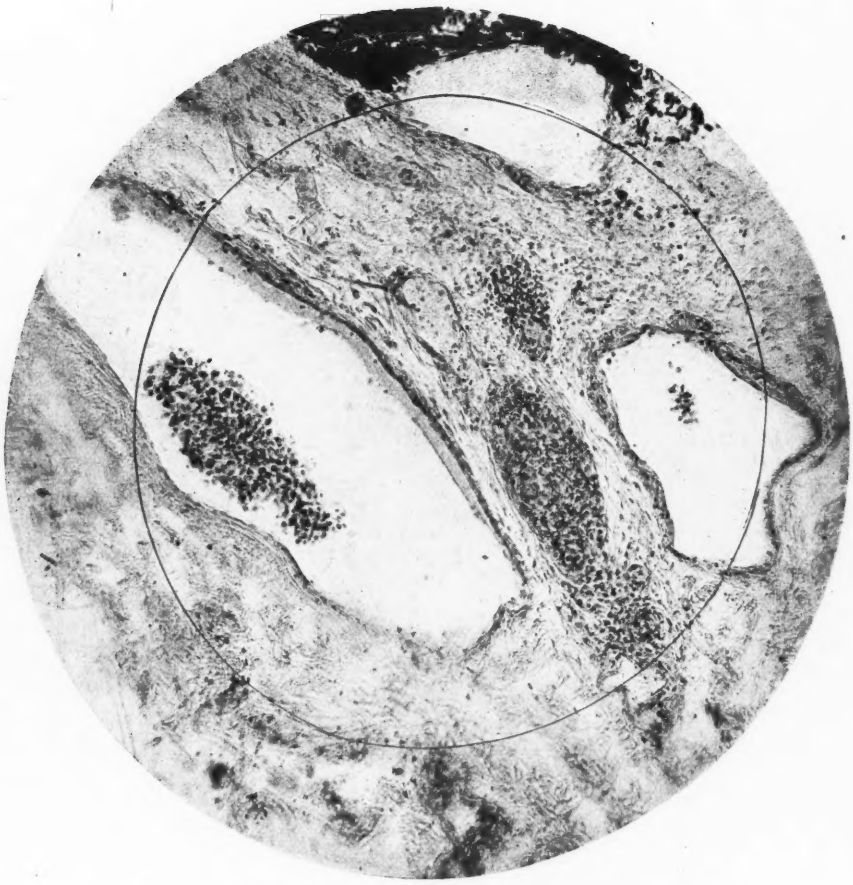

FIG. 11. GANGLION SITUATED BETWEEN TWO LYMPH VESSELS

The ganglion and the surrounding structures are involved in the general inflammatory process.

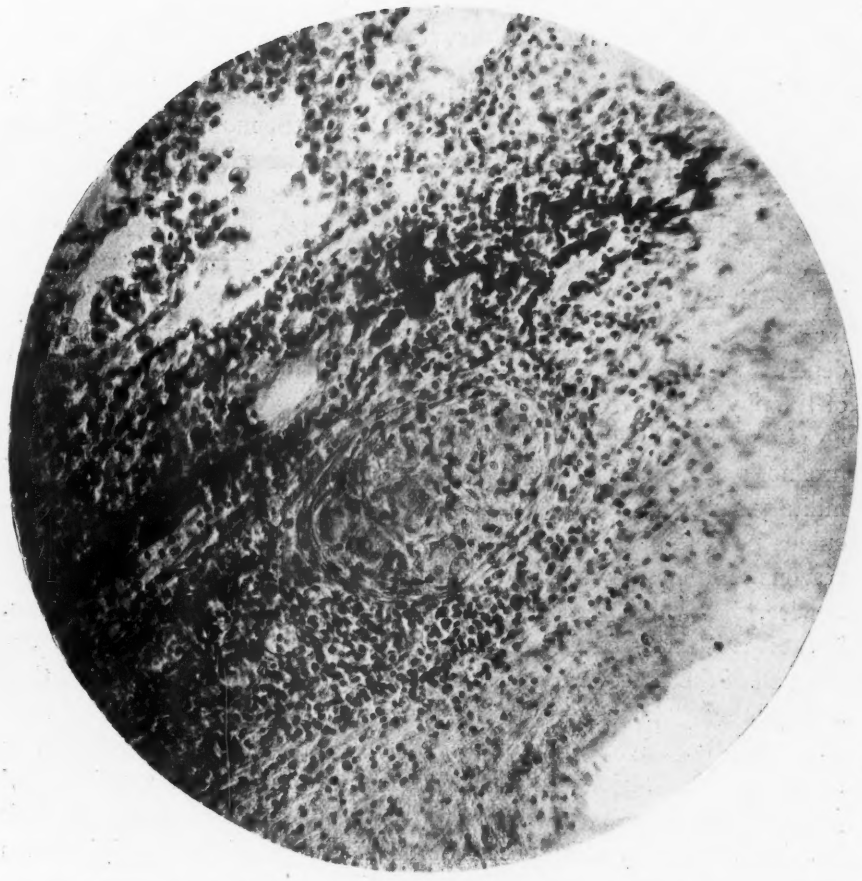

FIG. 12. GANGLION SITUATED IN AN AREA OF INFLAMMATION AND ITSELF INVADED BY THE LYMPHOCYTES

MANIFEST PULMONARY TUBERCULOSIS[1]

GEORGE E. BUSHNELL
Colonel, United States Army, Retired

While numerous articles in the medical press are devoted to methods of detecting incipient tuberculosis the study of the more advanced forms of pulmonary tuberculosis is by comparison much neglected. The text books, with their numerous subdivisions and wealth of detail, are confusing to the beginner, who is apt to feel at a loss when confronted by the varied signs of large tuberculous lesions. Yet the importance of skill in the diagnosis of age and kind of lesions present in a given case is great for all who have to do with tuberculous cases, for upon such diagnosis depends the prognosis. Prognosis is the first and last thing demanded of the physician by the patient's friends, and upon the prognosis which he gives he is judged. In military medicine a correct diagnosis and prognosis is perhaps peculiarly desirable, because the conditions of military service frequently make necessary the transportation of tuberculous patients, sometimes over great distances. It is important, for reasons of humanity and for the credit of the medical officer and of the service, that he distinguish transportable from non-transportable cases. Too often it seems to be considered that, a case once labeled as tuberculous, all of the usual contraindications as to travel are removed and that a moribund patient may properly be sent on long journeys to seek forsooth, the advantages of a change of climate. Medical officers should be held strictly responsible for the exercise of an enlightened judgment as to cases which may or may not be evacuated from their hospitals, not only as respects the obvious indication that dying men should be allowed to pass their last days in peace, but also as respects the retention for proper periods of patients with exacerbations or with a history of recent hemoptysis. In view of the above considerations it has seemed to the writer expedient to attempt a brief discussion of some of the salient points in the diagnosis of the manifest pulmonary lesion with a view to indicate simple methods of reaching an approximate

[1] Published by authority of the Surgeon General, United States Army, in the *Medical Record*, the *Military Surgeon* and the AMERICAN REVIEW OF TUBERCULOSIS.

diagnosis and prognosis of the disease. The effort has been made to simplify the subject by the omission of all but the most important points, in the hope of furnishing clues for threading the maze of signs and symptoms of the advanced cases. As in all attempts at simplification, the danger is run of omitting too much, of making unguarded statements which may be all too successfully attacked. It seems best, however, to run this risk rather than to incur the other risk of confusing the presentation of the subject by guarding the statements made so carefully that the rules involved are lost sight of in the exceptions. No one can be more conscious than the writer of the difficulties of such an undertaking and he offers this contribution in the hope that its shortcomings will be viewed with charity.

In order to assist the inexperienced, after a discussion of the various types of the disease, paragraphs have been added which indicate by questions the points which should be borne especially in mind in the study of the tuberculous lesion.

FIBROSIS

When tuberculous infection first takes place the cells of the body begin to receive a pabulum through the blood which is changed in quality. It has a tuberculous taint: the products of the tubercle bacillus and the albuminous constituents of the blood which have come in contact with these products and have been changed thereby afford a new nutritive problem for the tissue cells. They must hereafter obtain their nutrition from materials of an altered quality; they must learn to digest tuberculized albumen. Hence a change must take place in the nature of the ferments which are to convert the nutritive substances furnished by the blood into other substances adapted for the special needs of the cells in question. This change in the functional activities of the cells begins at once. Grüner and Hamburger think that a change in the reactivity of the body can be demonstrated to occur within six days after infection, but the initial changes are only a beginning. The process requires at least three months before it can be said to furnish a good measure of protection, and years elapse before the body has attained the power to digest tuberculized albumen or, if you please, to furnish tuberculocidal or bactericidal ferments, to the fullest extent of which it is capable. Immunity, then, shows itself in the ability to furnish ferments capable of attacking the tubercle bacillus and its products. Looking at the process from another standpoint we may say

that immunity manifests itself in the ability of the cells to maintain their existence and to proliferate in the presence of the poisons of the tubercle bacillus. The well nourished vigorous cells will naturally gain such power more quickly and to a greater extent than those less healthy. The stronger and better nourished the individual, the greater his chance to acquire a durable immunity, provided that the initial dose of poison has not been too large. Excessive doses of toxic substances or defective nutrition of the cell defeat the effort to acquire resistance. If the two unfavorable factors are combined the result of the infection is disaster, immunity is not acquired, and the initial tuberculosis leads speedily to death. We may judge then of the degree of immunity by the success with which tuberculous lesions are isolated through the formation of a capsule of connective tissue which prevents their further growth. One disadvantage is, however, apparent in this isolating process, which is that the poisons of the focus are accumulated instead of being dispersed. A point may be reached beyond which the concentration of the poisons of the focus can not be endured by the most vigorous cell, the cells die, small foci coalesce into a single large focus and a cavity may result. Even yet there is an opportunity for the defense to rally, the cavity becomes surrounded by a thick wall of fibrous tissue, the more readily because the caseous tissue has dropped out and no longer poisons its environment, and the former lesion may first be discovered at autopsy after many years of immunity to tuberculous infection. This is the explanation of the hard saying, cavitation is a sign of immunity—immunity shows itself by the isolation of the focus even though such isolation leads to the death of the cells most closely involved. We see then in the most chronic cases few and large foci sharply circumscribed and isolated, instead of the many and smaller foci surrounded by little or no new-formed connective tissue which characterize cases of less resistance. The process of isolation of the tuberculous focus being favored by relative rest of the part, large foci or cavities are typical of lesions of the upper part of the upper lobe, and are succeeded by smaller lesions as the disease progresses downward to parts of greater motion. Though the initial efforts to resist the spread of the disease may fail, the cells of the resistant organism still retain the power to proliferate in the presence of the toxic substances of the tuberculosis, the result of which continued during many years is the formation of great beams of connective tissue about the upper lesions. By the time that death finally ends the long struggle the upper lobe, even the entire

lung, may have become converted into a fibrous sponge, contracted sometimes by the drawing together of the fibrous threads into a small gristly mass of bronchi, bloodvessels and fibrous trabeculae, which bears little resemblance to the normal lung either in size or in structure.

From the foregoing we draw two conclusions; first, the presence of abundant fibrous tissue is a sign of an old lesion; second, it is also a sign of relatively high immunity. From the physical properties of fibrous tissue, its relative non-vascularity, its contractility, and from its density as compared with normal pulmonary tissue we would expect that the lesion would be dry, that the tissues would be indurated and that breath sounds would be conducted with increased distinctness. Fibrous lesions are in fact characterized by diminution or absence of râles, by well marked dulness on percussion, by distinctness of transmission of the voice and, above all, by a sharpened inspiration and a prolonged as well as sharpened expiration.

The defense exerted by fibroid encapsulation is often loosely spoken of as an absolute mechanical defense, as if the wall of fibrous tissue were really impenetrable for the tubercle bacilli. That this is not true is shown by facts such as the following: first, in well marked cachexiae, as of cancer, reactivation of ancient tuberculous foci sometimes occurs; minute invasions of new-formed tubercles are found on close examination to have proceeded from hard contracted fibrous glands at the hilus or elsewhere in the deep lung, without evidence of active tuberculosis in other parts of the body; second, at autopsy we often find evidences of the invasion of fibrous structures by tubercles as part of the miliary extensions characteristic of the pre-agonal stage of the disease, perhaps as a row of minute tubercles like a string of pearls, threaded through the midst of a massive beam of fibrous tissue. The connective tissue wall is a protection, but not an absolute one, against farther dissemination. Only the ferments produced by the immune cell can truly inhibit the growth and extension of the tubercle bacilli. Fibrous tissue thus invaded is no longer a dry tissue. But, with this exception, it is correct to say that in general the fibrous lesion is a dry lesion.

CASEATION

The effect of the presence of caseous foci is to produce a wet lesion. As will be understood from the foregoing, a caseous mass, even if surrounded by dense fibrous tissue, may still soften and liquefy. We may

have numerous caseous areas embedded in connective tissue, some of which are dry and apparently stationary, while others are in the process of breaking down. In general, however, the presence of numerous caseated areas discourages the formation of fibrous tissue. Where fibrosis predominates, the lesion is called fibrocaseous. Where tubercle is abundant, it is called caseofibrous. Thus, it will be seen, the presence or absence of moisture determines in a rough way the amount of caseous tissue present, the absence of moisture usually establishing the fact that there are at least no softening tubercle connected as open lesions with the air tubes of the part, while the presence of abundant moisture leads us to conclude with some degree of probability that the reverse is true.

BREATH SOUNDS

The bronchovesicular breathing in the chronic case may be said to be a sign of the presence of fibrous induration. It is also characteristic of the dry lesion. Dryness greatly favors the conduction of the bronchial sounds to the periphery. A wet tube may give not bronchovesicular[2] but rough breathing; or the breath sounds, at least in feeble or moderate respiration, may be indistinguishable from the normal, even though considerable induration be present in a fibrocaseous lesion. In massive caseation the tissues have lost their elasticity and, in so far as they are caseated, do not expand at all in inspiration. (Plate VII.) Ordinary breath sounds are absent in such cases, or are present enfeebled in less complete caseations. Ordinarily what is heard is a weak and distant bronchial breathing conducted from the deep bronchi and mingled with the coarse râles characteristic of these tubes.

The observer should, therefore, be on his guard not to draw necessarily a favorable conclusion from the absence of small or medium-sized râles when the patient's condition is bad. In gangrene, breath sounds are lost over the affected area. The same is true of plugging of the bronchi which may be temporary or permanent, the result in the latter case being ultimately caseation as a rule.

RÂLES

Râles are divided into typical pneumonic râles, the crepitant and subcrepitant, and indeterminate râles, the latter including all râles not

[2] For the sake of brevity the term "bronchovesicular" is used to designate a change in breath sounds which consists in increased harshness or "sharpness" of inspiration and expiration, with prolongation of the latter.

characteristic of acute pneumonic inflammation. Indeterminate râles may profitably be subdivided into typical and atypical râles. The typical indeterminate râle is moist, viscid, small or medium in size (but always larger than the true subcrepitant râle), is heard during inspiration, bursts near the ear and may occur in showers. It is formed in small bronchi, plentifully supplied with exudate as the result of inflammatory reaction to neighboring tubercle. Its presence is therefore a sign on the one hand of the existence of an active superficial tuberculous lesion, and on the other hand of the fact that there is no massive caseation: the tubercles are still discrete and the process, therefore, either recent or of only moderate acuity. As the crepitant and subcrepitant râles are signs of acute inflammatory reaction, so the typical indeterminate râle is a sign of chronic inflammatory reaction and, further, just as crepitant and subcrepitant râles disappear when exudate fills the alveoli, so does the small moist indeterminate râle disappear when bronchi become occluded or extensive caseation has developed. The disappearance of small moist râles in a given region of the lung with advanced lesions is therefore of as much significance as their presence. Localized persistent and numerous typical indeterminate râles constitute the best evidence of the existence of chronic inflammation in lesions containing discrete tubercles and furnish a means of determining the location of deposition of tubercle in fibrocaseous lesions. The atypical indeterminate râle is found in tubes which contain varying and usually relatively small amounts of fluid. Hence they have no fixed characteristics as respects size and time of occurrence in respiration. As a rule in tuberculosis the atypical indeterminate râle is the râle of the large bronchi but they are found towards the close of the early stage of miliary tuberculosis and in deep peribronchial tuberculosis. When they are disseminated over the entire lung, they are usually a sign of nontuberculous disease,—heart disease, pulmonary oedema, asthma, bronchitis or pulmonary excretion ("gouty bronchitis").

In examining a large lesion it should be remembered that, except in the most acute forms, it is altogether probable that the greater part of the lesion will not be undergoing a typical inflammation at the time of examination. The problem will be to determine the regions where there is true activity and to distinguish them from other regions in which the process has burnt itself out, where perhaps râles come from small cavities interspersed in massive fibrous tissue or where fibrous tissue

alone remains and transmits occasional râles from the bronchi beneath it. To accomplish this it is necessary to study carefully the characteristics of the various râles which may be heard. Râles bear no necessary relation to sputum. Indeed sputum is not a necessary concomitant of the tuberculous process; rather is it a complication, the evidence of irritation of neighboring bronchi. In some cases of extensive and active tuberculous disease there is practically no expectoration.

The degree of viscidity of the bronchial moisture is an important datum in the study of the chronic lesion. In fibrosis there is usually an old circumscribed lesion of the upper parts of the lung, a cavity, or at least dilated or otherwise damaged tubes from which exudes more or less mucus, mingled usually with pus. Hence cough and expectoration are present as a rule in cases of fibrosis. When the fibrosis is the preponderating condition the râles will be confined to the larger tubes, and the mucus will be viscid and raised with difficulty except so far as it may be diluted with the pus from pyogenic membranes. The coarseness of the râles reveals their origin. If small or medium râles are detected the lesion probably contains softening tubercle and the prognosis as to prolongation of life less good. The degree of viscidity and the abundance of the râles give some idea as to the relative acuity of the process, which is the more acute the less viscid within limits and the more numerous the râles. Least viscid of all the râles is the socalled serous râle. These are heard rarely in the chronic lesion under conditions which are little understood. The effect is as if the lesion had been flooded with a non-viscid fluid through which air bubbles. The râles are very numerous, burst without the characteristic delay of the mucous râle, as if, in other words, the rupture of the bubble were not attended by resistance, and have a peculiar soft, breezy quality which cannot be described. This phenomenon is generally evanescent and is not inconsistent with a considerable prolongation of life.

Râles constitute the auscultatory evidence of inflammatory reaction to the poisons of tubercle. They are the best evidence that the lesion is resisting its foes. Râles are absent in the obsolete or arrested lesion,—the body does not need to fight. They are present in the stage of reaction,—the body is fighting, whether successfully or not is to be determined in part by the number and quality of the râles, in part by other considerations which will be taken up in the following section. They may be absent again when the body can no longer fight, when the power to react has been lost. Nothing could be more erroneous than to draw

favorable conclusions from the diminution or the disappearance of râles in the very advanced case.

SYMPTOMS

As has has been stated, the number and degree of viscidity of the râles justify conclusions as to the acuteness of the tuberculous process, many râles of slight viscidity denoting a process which is not progressing favorably, and in which the lesions are breaking down with more or less rapidity. But conditions may be equally or more unfavorable when râles have become more viscid and scanty, or finally disappear entirely. For the determination of such a case recourse must be had to the symptoms: it is very important to determine whether the disappearance of râles is a sign of good or evil omen. If the patient is gaining weight, if he feels stronger, if fever is abating or absent, if expectoration of mucopus from cavities is lessening, the sign is a favorable one. If on the other hand the patient continues to lose weight, if cough and espectoration do not diminish, if fever continues and especially if it becomes more persistent, and the patient's strength grows less, the absence of râles is to be interpreted as evidence that the reactive powers are beginning to wane. The condition is naturally only finally determined after continued observation.

TOPICAL DIAGNOSIS

We cannot get a correct idea of the tuberculosis of the civilized man unless we think of it as a process which develops in the partially immune subject. Immunity against tuberculosis is produced successfully in the majority of the members of civilized races; so successfully, that in fully 70 per cent the disease is never recognized clinically and in the remaining 30 per cent almost all the cases of the manifest disease present themselves under a form very different from that which characterizes truly primary tuberculosis. Manifest tuberculosis is due to a temporary or permanent, complete or partial loss of immunity. The forms in which it appears differ according to the degree of immunity which has been present, but usually there is evidence of a considerable resistance during the early phases of the diseases. In the highly immune the manifestations of tuberculosis are the less apparent the more perfect the immunity; hence the failure to recognize the fact that tuberculosis is or has been present at all. However, the X-ray and the comparatively coarse tuberculin test, both subcutaneous and by the von Pirquet

method, give positive results so frequently that the most reasonable hypothesis is that the immunity of the untested or negatively reacting minority is also due to tuberculous infection.

NORMAL APEX

Breath sounds and percussion note are normal for location. Krönig's isthmus is broad and equal on both sides. The apices are resonant on Goldscheider percussion. This finding excludes well-marked chronic disease of the upper part of the upper lobe. *It does not exclude acute forms.* Examine for râles, on ordinary breathing and with expiration and cough, above and below clavicle on both sides.

APICAL TUBERCULOSIS

Observation shows that in the more resistant cases the first manifestation is in the apex. In the best cases the X-ray shows a single thickened line extending nearly vertically from the hilus which ends in a network as the surface of the lung is approached. The lines of the network terminate at the pleural surface, as it were a stream which branches into a delta near its mouth. When the resistance has been less the lines from the hilus become multiple, the superficial net work thicker and more complex and containing one or more discrete fibrous or calcified tubercles. A lesion of this degree is rarely recognized during its activity. It results in contraction of the apex shown by a narrowing of Krönig's isthmus, an induration recognizable by accurate percussion and by a slight change of breath sounds toward the bronchovesicular quality. Progressively less resistant are the forms in which the initial foci coalesce into one or more large foci which may become encapsulated or may lead to cavity. Usually by this time the process is no longer confined to the true apex and is more properly denominated tuberculosis of the upper lobe. Whereas the first forms described are wholly benign and are not usually recognized as tuberculosis until light is thrown upon them by the X-ray, the latter forms are accessible to physical diagnosis and should be recognized by dulness, and by bronchovesicular breathing with or without râles.

Apical lesions in the strict sense are of importance in diagnosis only as respects the decision as to whether a lesion is present at all. It is quite exceptional that a lesion in its acute stage is found in the apex which does not extend below the clavicle, though the possibility is of

course admitted. The apical lesion being in continuity with the extension from the hilus and being situated in lung which has little or no motion, is aborted in cases with reasonably good immunity. It then presents itself to the observer with the sign of a fibrous lesion. This fibrous lesion is often mistaken for a non-tuberculous collapse, or not detected at all. The non-tuberculous collapse being a simple atelectasis, is characterized by an enfeeblement or loss of breath sounds, the air does not pass freely into the lung, whereas in the fibrous lesion breathing is free and loud. The breath in both lesions may have the bronchovesicular quality but this is more marked and louder in the fibrous lesion. From the fact that the apical lesion is usually found in an arrested state, it is often not recognized and the later extensions lower down in the upper lobe are taken to be the first of the superficial lesions. The doctrine is held by many that the earliest incidence of tuberculosis is at a point lower down in the upper lobe than the apex or is even at the upper edge of the lower lobe. The X-ray shows, however, that in the great majority of cases the apex is the first of the superficial parts to be invaded.

UPPER LOBE LESIONS

Often the tuberculous lesion of the upper lobe has consisted in the deposition of a few tubercles which remain discrete, become fibrous or calcified, or, if small, disappear entirely and the existence of a lesion is to be determined solely by the signs which point to diffuse thickening of the connective tissue framework. If pneumonia occurs, the period of pneumonia inflammation being a self-limited one, the probability is great that lesions of the upper lobe will be first detected when they have reached a stage of chronic inflammation or of the induration or caseation which marks the terminal stage of the local process. As a matter of fact it is quite rare that true subcrepitant or crepitant râles are found in this region. The lesion as it usually presents itself is a chronic lesion, characterized by a harsh inspiration and harsh and prolonged expiration with or without indeterminate râles according to the activity of the process. Not rarely a well marked lesion of the upper lobe is seen which has run its course and become arrested without the knowledge of the patient and without detection by his physicians, in some cases notwithstanding numerous examinations. The writer recalls a clergyman coming for examination on account of hemoptysis, who had a typical paralytic thorax and extreme gastroptosis, and who stated that because

his appearance led to the suspicion of tuberculosis he had been frequently examined for that disease, in the large eastern city in which he dwelt, but always with negative results. Notwithstanding this history there was a well marked and good-sized lesion of the right upper lobe which was shown with great distinctness as an old and arrested condition by the X-ray. The history pointed back with clearness twenty years to the inception of the disease as a manifest process.

Less chronic and less indurated small lesions of the upper lobe are detected with greater difficulty. Percussion gives slight dulness on the affected side, with usually some increase in vocal resonance, the breath sounds are of the bronchovesicular type, but not necessarily markedly so. The measure of the degree of induration and contraction is sometimes better afforded by the narrowing or disappearance of Krönig's isthmus than by the classical signs over the lesion itself which are often rendered indistinct by a compensatory emphysema of the neighboring lung.

The presence of an old lesion may only be shown by bronchovesicular breathing and a slight shortness or raised pitch of the percussion note as shown by careful comparison with the other side. (Bronchovesicular breathing in the second interspace right side, near sternum, diminishing rapidly outward and downward, is normal. If the signs extend outward in the second and third interspace for more than a short distance, there is a lesion.) But it does not follow that a lesion of this kind is of clinical importance. There is as much difference in the severity of even arrested lesions as exists between a scorch of the skin and a burn of the third degree. It is one of the remarkable facts in physical diagnosis that slight changes in the fibrous framework, so slight as ordinarily to escape notice at autopsy, if they extend to the surface, may be detected by auscultation and percussion. In one case the X-ray showed a single line from the hilus, ending near the surface of the apex in small branches, the lesion dating back to a hemorrhage thirty-eight years ago without evidence of any signs or symptoms since that time. Several experts have independently determined the existence of an old lesion by physical diagnosis. The importance given to the determination of such obscure lesions rests upon the erroneous assumption that harshness of breathing and prolongation of expiration constitute signs of an *incipient* lesion. As has been said elsewhere, if the increased transmission of sounds from the bronchi is due to inflammatory engorgement there is a frank lesion; usually these signs show a chronic condition. In

estimating prognosis we should consider the intensity of the now obsolete process as carefully as its extent. There is a wide range from the lesion in which the pleura is glued fast to the ribs, breathing is harsh, dulness is marked, X-ray shows many strongly marked lines, and one like that referred to above. The first type has some clinical importance, the second is to be neglected. It is therefore incorrect to fill wards with so called suspicious cases in which the determination of the diagnosis is delayed from doubt as to the significance or importance of obscure signs, there being no reason why the diagnosis cannot be made at once. It is true, of course, that the possibility of a dissemination of tubercle which has not yet given signs of its presence introduces an element of uncertainty in *all* diagnosis, but the chance of such a dissemination in an obsolete lesion is much less than in a healthy part of the lung. It is only justifiable to suspend the rendering of a diagnosis in cases in which the patient is much more ill than can be accounted for by the visible disease.

THE LARGE SUPERFICIAL LESION

Typically this lesion is made up of a cavity surrounded by abundant fibrous tissue above, below this a few large isolated tubercles, still farther down numerous small tubercles (Plate II). Above we find well marked dulness on percussion, cavernous breathing or very harsh bronchovesicular breathing, increased vocal fremitus and resonance with pectoriloquy over the cavity. Proceeding downward an area is reached over which râles are finer, less viscid and more abundant. Dulness may be present but to a less marked degree, and voice sounds are less clearly transmitted. Still farther down the râles may be yet finer, the dulness less clearly made out or absent, and a patch of true subcrepitant or even crepitant râles may rarely indicate a beginning caseation. A lesion of this kind may called a compound lesion. It represents at least three stages of development: first, the stage of cavitation in which the disease has burnt itself out; second, a stage of the development of large foci under conditions of fairly good resistance; third, a succeeding stage in which resistance has greatly lessened and the disease is beginning to have its own way. A process of this kind denotes a progress of years. The prognosis depends upon the kind and number of râles in the lower parts of the lesion and whether or not there is evidence there of circumscription of the process from the presence of fibrous tissue; in short, whether or not the breathing is of the bronchovesicular type characteristic of such tissue.

Is the breathing bronchovesicular, with no râles, the changes in breath sounds being slight and well diffused, dulness being elicited with difficulty? Here we have an obsolete lesion with diffusion of fibrous induration of no marked degree. If the signs are well marked we have more extensive fibrosis. The absence of râles even after expiration and cough shows that the lesion is arrested. Of course the more marked and extensive the fibrous induration, the more severe has been the attack and the greater the likelihood that caseous masses are present in the lesion. The absence of râles shows them at least to be dry and well encapsulated. We speak of this lesion as a fibrous lesion, meaning of course a lesion the course of which is chiefly influenced by the fibrous component. If with the same signs small indeterminate râles are also present, the prognosis of the lesion is worse because their presence makes it probable that there is softening tubercle. We infer as to the extent and importance of such foci by the abundance and wide distribution (or the reverse) of such râles. Numerous and well distributed clusters of moist râles lead one to think of numerous disseminated caseous foci which are softening, whereas a few râles may proceed from a bronchus irritated by an insignificant tubercle. Proceeding downward, if the lesion is dry, do all the signs cease at the same line which is distinctly marked? If so, the lesion is arrested. This sign is obtainable with more distinctness in the case of well marked fibrosis than in the more diffuse and indistinctly marked fibrosis due to sparse and small arrested tuberculosis foci. In case of râles the lesion extends downward at least as far as râles are heard, though dulness and breath changes may not be made out over its full extent. If râles extend below the other signs they will be rather small moist râles, and they show a recent superficial extension of an acute kind. Patches of pneumonia may be found in such extensions, characterized by crepitant or sub-crepitant râles; but this is rare. The lesion in the case considered may extend by deposition of new tubercle below the physical signs, the foci not being apparent until inflammation has led to râles.

Study a lesion of this kind to determine the relative age of its parts and the topographical distribution of caseous and fibrous tissue. Is the lesion a simple one, that is, are the signs alike throughout, indicating cotemporaneous involvement of all parts of it, or is there an older lesion above with well-marked bronchovesicular breathing and a relatively dry lung while patches of râles below with harsh breathing indicate an active chronic lesion and much fibrous tissue, or with nearly normal

breath sounds show a wet lung with much softening tubercle, or again with normal breath sounds show the presence of an acute extension? Is the lesion above fibrous with preservation of much of the alveolar structures, or is the breathing cavernous, what remains of the lung being converted into airless fibrous tissue? Are the râles rather small or medium moist râles and numerous, indicating dense tubercle deposition, or are they coarse râles produced only in the cavity? Can more than one extension be made out, a fibro-caseous lesion below the cavity being succeeded by an acute dissemination of numerous tubercles? Or on the other hand, is the whole process arrested in its downward progress, as proved by the fact that all signs terminate at the same level?

PERIBRONCHIAL EXTENSIONS IN THE SAME LUNG

In lesions of the upper lobe the force of inspiration being in the direction of the ribs, tuberculous lesions are most marked or in slight cases only existent near the surface of the lung. Extensions downward implicate especially the superficial portions of the lung and are conditioned by suction of lymph from parts of less to parts of greater expansibility. But in the lower chest the lateral expansion of the thorax has less influence upon the lymph supply than the movements of the diaphragm. The front of the invader is accordingly directed downward. There is this difference in the two situations, however, that the very mobile and expansile base is in too active motion to permit the establishment of tuberculous foci. Unless pleural adhesions prevent active motion the base of the lungs generally remains free of tubercle, at all events until shortly before death. The tubercle invasion is checked in the bronchial tubes which run downward and outward and directly downward, but such checking tends to assemble the invaders, returning them to the hilus whence they can act as reinforcements elsewhere. The bronchi which extend laterally through the lower lobe, since their lymph channels run nearly at right angles to the diaphragmatic suction, are particularly exposed. It is common to see an extension along such a bronchus which shows itself at autopsy as a series of bronchopneumonic foci grouped about the tube (Plate IV). Here we have what is really an atypical peribronchial extension. During life our means of diagnosis do not permit the recognition of the fact which is, however, worthy of note as respects the prognosis. We may put the facts in this way. Extensions in the lower lobe are more apt to involve

the entire course of the bronchus, from the hilus to the periphery, than extensions higher up in the lung. What we judge of as superficial extensions of perhaps slight extent are here really the outward manifestations of a very considerable process, the greater part of which runs its course in the deep lung.

LESIONS OF THE OTHER LUNG

All pulmonary tuberculosis is essentially bilateral, so far at least as the deep lung is concerned. The X-ray shows involvement of both deep paravertebral regions, but more marked as a rule upon one side than the other. On the side less involved the process may remain restricted to the deep lung, or in time it may in its turn reach the apex and develop superficial lesions of the upper lobe which do not differ in their pathology from those of the lung first attacked. As a rule lesions of the lung secondarily involved are larger and more acute than those of the side first affected. It is a very common error to overlook the initial superficial lesion and to consider the second as the first involvement, or, if the presence of a small lesion is discovered, to consider it secondary in point of time to the larger lesion. The distinction is made as follows: the older lesion will show obliteration or greater contraction of Krönig's isthmus, a harsher breathing and a more prolonged expiration.

Although the first extension from the hilus is peribronchial, after the period of manifest tuberculosis is reached peribronchial extensions are almost always secondary to superficial and more or less circumscribed lesions.

When a tuberculous process has run its course and become arrested, the process having been sufficiently marked to arouse successfully all the defensive powers of the organism, the result is a certain local immunity. Tuberculosis will not develop anew at this place as readily as elsewhere in the lung. If therefore a patient presents evidences of constitutional impairment, fever, lassitude, purulent expectoration, etc., and a superficial examination shows a completely dry lesion of, say, the right upper lobe, it will not do to ascribe the symptoms to this lesion, for an arrested lesion has no symptoms. Especial care should be taken to examine the opposite side, in this case supposedly the left, for the slight evidences of peribronchial processes which are so readily overlooked by the careless observer. Failure to institute proper measures

in season may lead to an intensification of the peribronchial process such that when it finally forces itself upon the physician's attention the case is quite hopeless so far as recovery is concerned; whereas, if taken in time it might, perhaps, have become arrested.

Examine with especial care the character of the breathing of the upper lobe of the other side, comparing it frequently with a normal part of the lung. Do not commit the error of considering a tympanitic note over an acute lesion to be normal, the normal side to have dulness. The distinction is made by the pitch. The diseased side will have a higher pitched shorter percussion note. On the side with the broader Krönig's isthmus is there also a lesion? Is the bronchovesicular quality of the breath sounds less marked, showing a more recent extension? Are râles present showing activity? If a superficial lesion is not made out, does careful comparisons of the breathing of this side with a normal part of the lung show a bronchovesicular quality to be present? Does it extend throughout the upper lobe? If so, there is a peribronchial extension. This may be purely lymphangitic, or, being of greater severity, it may still be arrested, in which case there will be no râles and the prognosis is good. If râles are present they vary from very abundant to scanty. The prognosis is bad in proportion to the abundance and distinctness of these râles. Do not expect to find, as a rule, râles which break near the ear: the early râles of peribronchial tuberculosis are distant and atypical. It is as if one were obtaining signs of a process which is evolving nearly out of reach. It is important to exclude a massive peribronchitis limited to the deep lung which sometimes occurs. The characteristic physical signs of this process, when well marked, are a limitation of the expansibility of the lobe involved, not to be explained by other factors (pleural adhesions), and a higher pitched percussion note on strong percussion as compared with the symmetrical point on the other side. The percussion stroke should be heavy, in order that it may set the entire side in vibration, the idea being to see whether the fundamental note of the lower thorax is altered by a loss of homogeneity through deep infiltration. A radiograph is of immense assistance in the determination of such cases.

THE BILATERAL TYPE OF PERIBRONCHIAL TUBERCULOSIS

We consider here only those forms of fibroid or cirrhotic change which can be ascribed to tuberculosis. The presence of tubercle bacilli in the

sputum and the history of tuberculous disease are important data in the diagnosis.

In cases with high immunity in which the process at one time has been severe, the X-ray shows both lungs involved with long and heavy streaks radiating out from the hilus, following the normal course of the bronchi and blood vessels and representing these structures thickened by an enveloping fibroid induration. The two sides are not universally or equally involved but in both the induration extends well into the lower lung. This condition may develop and become arrested without leading to conspicuous symptoms, the extensive fibrosis revealed by the X-ray being often greater than signs would have led one to anticipate. In other cases the shadows are massive and the course of the tubes and vessels is no longer apparent. The enormous formation of fibrous tissue speaks for a high original immunity but at the same time an immunity which has been excessively stimulated; in other words, there has been a strong reaction to the presence of widely spread tubercle bacilli and bacillary poisons. The more massive the indurations the more likely therefore that they contain disseminated tubercles. Such tubercles may have become calcified or fibrous at the time of examination, so as probably no longer likely to be of harm, or they may be a source of great danger. The distinction is two-fold; first, the presence or absence of râles; second, the general condition of the patient as respects emaciation and fever. The râles are indeterminate, not very large nor very viscous. They may be disseminated irregularly over both sides, they may be irregular in their appearance, being heard for example over the back on both sides at one examination; again only or chiefly on the right; still again only or chiefly on the left. No favorable deduction should be drawn from the diminution or disappearance of those râles unless such changes be shown to be permanent. This they almost never are. The system has put forth enormous efforts in laying down the almost incredible amounts of fibrous tissue. Notwithstanding these efforts the râles show that the defense has been a failure, a secondary crop of tubercles has made an invasion, and this is really the beginning of the end which, manifesting itself usually as a miliary extension, is deferred more or less according to the patient's mode of life. The breathing in both types is harsh with prolonged expiration. Dulness is distinctly present. The transmission of the voice is increased but owing to the bilateral character of the affection gives little useful information. In those cases in which extensive fibrosis has been superadded to an origi-

nally slight well-encapsulated lesion there is no cough and expectoration. If a cavity of the upper lobe has not dried up the sputum is characteristic of that condition. Cough and purulent sputum in conjunction with râles in cases in which no unhealed cavity exists, is too often an ominous sign.

ACUTE PERIBRONCHIAL TUBERCULOSIS

There remains to be briefly described those cases in which there has been a sudden and extensive formation of tubercle about the bronchi. In the cases seen by the writer this has occurred on the heretofore healthy side opposite an old and apparently nearly or quite healed lesion. The disease may develop without warning in persons who believe themselves quite well. In this dreadful type of peribronchial tuberculosis the masses of tubercle are grouped so thickly about the bronchi that the latter become inflamed. The peribronchial becomes bronchial tuberculosis, that is, the process progresses toward the lumen of the bronchus, in some places it perforates at an early date, there is bacilli-laden sputum; over long stretches the tubes are as yet only stiffened with inflammatory exudate, the mucosa is irritated and swollen. A reflex cough is excited which is incessant and perfectly hopeless as to results. The only relief for the unfortunate patient is efficient doses of morphine, the effect of which however soon wears out. The spasms of cough generally terminate with vomiting which is further favored by the large doses of morphine, and the patient is speedily worn out by the addition of inanition to his other troubles. The breathing in this class of cases is of the broncho-vesicular type, perhaps harsher and louder than in less severe cases. Here exceptionally the breath sounds are conducted along the bronchus by an acute inflammatory instead of a fibrous induration.

LARGE SLUGGISH LESIONS

The large lesion which has been described with the cavity or the well marked fibrous area above, succeeded by smaller cavities or by relatively small caseous foci imbedded in a more or less abundant fibrous tissue, to be perhaps succeeded in its turn by a series of such smaller, more or less closely aggregated tubercles, is a condition which presents sharply drawn characters. It is typical in its development and is easily diagnosticated, the physical signs are readily heard through the thin chest wall and there is perhaps just a shade of dyspnoea which results in a force of breathing well calculated to make the auscultatory signs

distinct without conscious effort on the part of the subject. The most salient characteristic of a lesion of this class is its development according to law. There are individual differences, of course, of omission or of intercalation, but on the whole there is a typical course which is determined by two factors, the immunity of the individual on the one hand, and, on the other, the relative mobility of the part. Hence we expect cavities and fibrous tissue at the summit, followed by progressively smaller and more numerous lesions as the mobility of the lung increases downward and the lapses of immunity become more serious. The lesions might be compared to a mountain,—craters extinct or active at the summit, farther down caves, still farther, stratified rock of various kinds. But there is the difference that whereas in the mountain the age of the different levels increases downward, in the lung the lowest stratum of tuberculous tissue is the most recent,—a topsy-turvy geology as it were.

But there is another class of cases in which the diagnosis is not so easy. We distinguish two types. The first is obscure in its manifestations because the lesion consists essentially in a disseminated fibrosis which from its nature does not give very sharply marked signs. The problem here is to determine by comparison with the other side whether or not the tissues have been impaired in resonance and have had their conductivity of sounds increased, with the further important question: Is there evidence of the presence of disseminated tubercle, and if so, are these foci in a condition of activity? The problems which such a case presents are not difficult of solution for one whose ear is trained to detect minute changes in breath sounds and percussion note, except so far as the decision as to amount of caseous tissue present is concerned. The difficulties of the inexperienced are due to two causes; first, expecting to elicit well marked physical signs; second, giving morbid significance to normal topical variation in breath sounds. But there is another class of cases with larger and older lesions in which, while they are still no doubt subject to law, the laws which govern are plainly quite different and less easily explained, and the lesion when interrogated stands mute, it may seem, to the uninitiated, or gives out information as to its nature but sparingly. Such a lesion is usually found in cases of long standing in which the patient has been under favorable conditions as respects food and rest, but has been slowly retrogressing. If one examines such a lesion, dulness is present nearly everywhere over the thorax, breath sounds are faint or inaudible over the greater part of one or both lungs, râles are atypical, found here and there, differing in number and distri-

bution at succeeding examinations, the conduction of the voice is rather diminished than increased. In short, the examiner may conclude his examination with the feeling that there is undoubtedly a tuberculous lesion but that the determining of its age, distribution and prognosis is a very different matter. In such a lesion the difficulties of diagnosis are largely due to the presence of extensive plastic pleural exudates which act in various ways to obscure the physical signs. Chronic tuberculous affections of the superficies of the lung are, as a rule, accompanied by a certain amount of plastic pleurisy. Pleurisy of this kind can only occur when the tuberculous involvement of the visceral pleura and underlying lung is slight and chronic. In other words, adhesions cannot form over large caseous foci. The beneficent effect of pleurisy in prolonging life is not always considered. In its absence the first good-sized caseous tubercle that breaks down upon the surface of the lung will infallibly lead to a pyopneumothorax. That this complication is comparatively rare is the best proof of the rôle of the pleural adhesion. We expect then more or less pleurisy to accompany every well marked and large chronic lesion. In cases with high immunity, in which lesions develop slowly and are well demarcated, the pleurisy is, as a rule, limited to the immediate vicinity of the lesion, leaving the lower lung free to expand in respiration and thus check the downward progress of the disease (Plate II). In such cases we find that the basal parts of the lung furnish strong respiratory sounds and the autopsy shows this portion of the lung to be free from manifest tubercles. But in cases of less immunity, especially in the lung secondarily involved, in which a disseminated extension has taken place, pleurisy may tie down the entire lung, even involving the diaphragmatic pleura (Plate V). A lung thus affected operates under different laws. It is in a condition of enforced rest, is incapable of full expansion, and, under ordinary conditions, does but little of the work of respiration. It therefore comes under the influence of the law that lesions forming under conditions of rest will be larger, more discrete, more likely to break down into cavities. One sees rarely at autopsy a lung completely adherent everywhere through which are interspersed large caseous foci, such as are characteristic of the upper lobe lesion. Usually however the lesions have been laid down before the lung has become motionless, in which case they are small and numerous and the question is, will the effect of rest be helpful or harmful? The answer is, helpful if the dissemination is sparse, in which case the individual foci may become fibrous or calcified; harmful if the

dissemination is dense, the stagnant poisons then tending to break down the healthy tissue between the tubercles, with the result that the lung melts down into a vast cavity, if life is sufficiently prolonged.

In the majority of cases, however, the termination is neither fibrosis nor cavitation. The lesions neither very sparse nor closely aggregated, pursue an extremely sluggish course and the patient is generally carried off at last by some complication such as pneumonia, or his entire loss of immunity is shown by a final crop of miliary tubercles in the lungs or throughout all the viscera.

Even in these cases the signs of a former immunity may be shown by the difference in behavior of the two lungs. In one the tissues are drier, there is a sharper respiration, there may be old cavities in the upper lobe, the lesion is more sharply demarcated below, the lung below the lesion may be free of morbid signs and the respiration of the individual may be largely carried on by it. Whereas on the other side the breathing is faint, often apparently normal, râles are indeterminate, rather large and few under ordinary breathing, sometimes developing showers after effective cough. The percussion note is dull everywhere, sometimes approaching flatness in the lower axilla. Flatness is of course a sign which should at once lead to the suspicion of the presence of effusion. But in the class of cases under consideration the percussion note is very dull, rather than flat. Fremitus is absent but vocal resonance can still be obtained. This is known as Kuthy's dissociation phenonemon. The discoverer explains the absence of fremitus by the supposition that the voice cannot cause a commotion of the thoracic wall because the vibrations are checked in passing through the non-homogeneous stratum of the thick plastic adhesions, whereas the sound of the voice having greater penetration still reaches the ear.

In studying these difficult cases determine first which lung has the older lesion. Often the patient knows only of the older lesion, believing his disease to be unilateral. Fibrosis and cavity above, succeeded below by well marked bronchovesicular breathing throughout the lesion, the lower edge of which is sharply demarcated, the breathing at the base being free, and exaggerated or puerile in character are favorable signs. The prognosis of this lesion depends however chiefly upon the number, density (abundance) and size of the râles following cough. Usually the lesion is a wet lesion, approaching in its character that the newer lesion of the opposite side. The more recent lesion is characterized usually by absence of cavity, or cavities when present will be recent, by

feeble respiration with inability to increase its force above a certain slight degree. Often the examiner will believe that the patient is making no effort to breathe until comparison with the other base shows powerful respiratory movements with correspondingly loud breath sounds there. Vocal resonance may be less loud than on the other side but everywhere present. The presence or absence and the distribution of vocal fremitus furnish a clue as to the density and thickness of the plastic exudate of the pleura. The lesion is a wet lesion, the number, size and density of the râles constituting the best guide to the condition as respects caseous foci. In general the prognosis as respects prolongation of life is better the more obscure the physical signs, and it is to be determined partly by the amount of fibrosis present but chiefly by symptoms (fever, expectoration, emaciation, loss of strength, etc.) rather than by signs. Here, as in other advanced lesions, the observer should be on his guard against drawing favorable conclusions from the absence of signs of moisture if the patient's general condition is distinctly bad.

In studying these lesions Krönig's isthmus may not indicate the age of the lesion, being contracted on both sides. The older side may show a sharper breathing, a smaller lesion, a free base, perhaps a larger cavity. Are there extensive pleural adhesions as shown by restricted breathing? Are vocal resonance and fremitus increased showing the influence of the parenchymatous lesion, or diminished showing an extensive plastic deposit in the pleura? What is the amount of fibrous tissue? Are there extensive areas with dulness and harsh breathing but without râles, or is the whole lung wet and the bronchovesicular quality absent or but slightly marked in the respiration? Do showers of râles on expiration and cough show that there is inflammatory reaction or softening tubercle, or are the râles few and coarse from cavities or irritated bronchi? The prognosis will probably be determined by the condition of the more recently involved side. Is the lung involved throughout or to a lower level than the other side? Bear in mind the effect of extensive pleural adhesions in restricting the breathing so that less information will be obtained from study of breath sounds. Percussion gives much useful information here. Distinguish the very dull note of plastic exudate from that of the more resonant parenchymatous lesion. Is the newer tubercle breaking down? Are there indications of a cavity of the lower lung? Do not forget to exclude empyema and localized pneumothorax. Consider carefully the patient's general condition and bring it into relation with the physical signs.

There is one class of cases apparently similar to those just described which presents great difficulties in diagnosis and prognosis. It may be described as a lesion with all the evidences of advanced disease, dulness, changes in breath sounds, abundant moisture, etc., in which the patient's general health is good entirely out of proportion to the apparent gravity of the lung conditions. The writer has in mind one case in which the breathing of the right lung was greatly restricted and the lung was everywhere full of râles, in which there is rarely fever, the nutrition and appetite excellent and the patient so little conscious of ill health as to be desirous of accepting a commission in the Medical Reserve Corps. Here we have a case in which firm adhesions interfere with the play of the lung and lead to a stagnation of the lymph, the moisture apparently being due in large measure to such stagnation rather than to the exudation of active inflammation. It is probable that the fluid in the lung of such cases is due in part to errors of metabolism but this is a point which demands further study. The determination of such cases is made by the dissociation of signs and symptoms. The patient's condition appears desperate from physical signs but the symptoms indicate a very tolerable, though of course precarious, state of health which may be enjoyed during some years. Here, as in all advanced cases, symptoms furnish the surest clue to the prognosis.

THE CAVITY

Cavities result from the death and absorption of pulmonary tissue. They are divided into superficial and deep, open and closed cavities. Occasionally a cavity of the upper lobe is seen in which the entire interior of the lobe has been scooped out, leaving walls of air-bearing tissue. Such a cavity is difficult of diagnosis, especially as respects its extent, even a thin wall containing air-filled alveoli having an extraordinary effect in diminishing the conduction of sound. As a rule, however, the cavity, especially the large cavity, has destroyed the superficial lung so that its external wall consists of little more than the two layers of the pleura glued together and firmly adherent to the ribs. From such a cavity sounds are conducted with startling distinctness. Most characteristic is the conduction of the voice and the whisper. Spoken words seem to be enunciated from the depths of the cavity; hence the term *pectoriloquy*. Whispering pectoriloquy is equally or more distinct in its peculiar reproduction of spoken words than is phonation. The

râles produced vary greatly, according to the quantity of fluid present and the resonance of the cavity walls. A very large cavity is always a more or less wet cavity. Small cavities are difficult of diagnosis. Occasionally a cavity is detected by the X-ray which gives no physical signs. Conversely a cavity may be diagnosticated by physical signs which is not shown on the radiograph. A closed cavity gives no certain physical signs. If full it is equivalent to an abscess. The presence of such a cavity may be suspected if its location and weight is such that it exercises a pull upon the pleura, in which case there is the characteristic hopelessly unproductive, "pleural" reflex cough, which once heard will always be remembered. A deep cavity also presents some difficulties in diagnosis. The marked physical signs due to the resonance of the walls of the superficial cavity are absent (Plate XII). Often the only sign is a respiration in which inspiration is almost inaudible, expiration very prolonged and deep-pitched. A variety of the deep cavity is the serpiginous cavity which appears at autopsy as a narrow sinuous tube extending sometimes far down into the lung, as if the process of its formation had consisted in a progressive melting away of the bottom of the sac. Its importance lies chiefly in the prognosis of hemorrhage. When in its downward course a cavity of this kind encounters a blood-vessel, hemorrhage is likely to ensue, which is raised with difficulty, the greater part of the effused blood infiltrating the surrounding lung. The fact that hemorrhage may appear to be slight or that it ceases altogether is of no importance if the patient's face becomes cyanosed. This is a fatal sign, evidence of the extensive infiltrations of the deep lung with blood which the autopsy will speedily reveal.

If the breathing is characteristic of cavity, we have to determine the size and position of the cavity and the condition of the surrounding tissue. Are the sounds from the cavity very marked, reaching the ear with the greatest distinctness, is the percussion note tympanitic or very resonant? We infer then that the cavity is superficial and the pleura adherent. Passing in all directions from the point where the sounds are most distinct, the patient counting vocally or in a whisper, note where the pectoriloquy, though still plainly heard, becomes less loud. We are now over lung tissue, but it is not always easy to determine whether the cavity still extends behind that tissue, the difference in sound being merely due to the interposition of a thicker wall, or whether the sounds are reflected downward into uninvaded territory. However, the important question is, what is the condition of the surrounding tissues or,

what amounts to nearly the same thing, what is the nature of the cavity? Is it progressing or stationary? The walls of the cavity may be of smooth and firm fibrous tissue throughout, or of sloughing masses of caseous material, interspersed among thickly studded softening yellow tubercles of small size; or there may be intermediate cases in which the tubercle persists in only a portion of the wall, usually the floor. The first type is characterized by the distinctness and metallic quality of breath sounds and râles, often by the scantiness of its contents (shown by the fact that râles are only elicited at the base of the cavity) and by their frequently tenacious character, the blast of strong respiratory movements of air producing what are plainly waves ruffling the surface of a mucilaginous pool, as it were.

When the walls, on the other hand, are soft and crumbling, the sonority of the acoustic phenomena is much diminished. Pectoriloquy is still present but one fails to get the impression of a resounding cavity. On expiration and cough the sides of the cavity are brought into apposition. Their separation in the following inspiration is sometimes manifested by a whiff and by a sound resembling numerous simultaneous moist râles. The contents of the cavity are usually much more abundant and râles of varying quality are obtained at a higher level. If the breaking down is rapid and the fluid largely pus, râles are not necessarily conspicuous or peculiar.

In some very advanced cases however there is an extraordinary viscosity of the greenish-yellow often blood-stained sputum which has been ascribed to the presence of nucleinic acid. In such a case the sputum hangs in ropes in the patient's mouth and he often attempts to extract it with his fingers after repeated failures to expel it in the usual way. In the cavity the same viscosity of its contents leads to the most remarkable variety of râles, snoring, bubbling, creaking râles, the sound of "new leather," simulations of friction rubs and the like, the diagnosis of which, if there is doubt, is speedily cleared up by the change effected by a coughing-fit. The sputum varies with the nature of the cavity contents, mucous or mucopurulent, viscous, comparatively scanty and raised with difficulty in the first type; more abundant, more frankly purulent, easily raised in the second type; raised with some and expelled with more difficulty in the variety just described. If the cavity is not large we must ask ourselves the question, what is the character of the remaining solid structures? About the encapsulated cavities, which may be multiple, there are masses of

fibrous tissue that are completely destitute of patent alveoli (Plate III). In such cases no respiratory sounds are forthcoming from the surrounding parts, the indurated tissues of which transmit the cavity sounds with great distinctness. The condition of the air-bearing tissue in the neighborhood of the cavity is determinable by criteria already discussed. A bad combination as respects general prognosis and also in the present case the probability of extension of the cavity is apparently normal low pitched respiration with an abundance of râles, and, worse yet, is such an abundance of râles as to render the breath sounds inaudible. One variety of the cavity which sometimes escapes the unwary is one in which the lumen of the cavity is practically obliterated by a dislocated heart. Some change in the heart's position probably occurs in every case of at all extensive cavity, the lung on the healthy side expanding to fill the vacancy and pushing the heart before it. In some cases the dislocation of the heart may be marked, the greater bulk of the heart being found to the right of the median line of the sternum or, in the case of left-sided cavity it may be tucked away well up toward the axilla. He who does not percuss out the heart and determine the location of the apex beat as a part of his study of lung conditions, is doomed to an occasional unpleasant surprise. One more word on this subject. Do not ascribe any signs of failing heart or possibly venous obstruction to a kinking of the great vessels as the result of the heart's displacement. The heart can be swung in any direction within the thorax without leading to any diminution of calibre of these vessels through undue approximation of their walls, as dissections have convinced the writer.

MILIARY TUBERCULOSIS

The term "miliary" relates merely, of course, to the size of the tubercles. A better name would be disseminated hematogenous tuberculosis. The complete failure of immunity which so often immediately precedes and is the cause of death in tuberculosis, is the signal for the development everywhere of tubercle, often minute and determinable only by the microscope, sometimes of a more chronic type and appearing as macroscopic yellow tubercles. It is incorrect to speak of death as occurring from miliary tuberculosis in such a condition. The term should be reserved for cases in which there is a large or a universal dissemination, often from an old and apparently insignificant focus, of minute tubercles, which constitutes the principal disease. Much

study has been expended upon the causes of this condition, but the point upon which especial emphasis should be laid is, that the initial condition which is the real cause of miliary tuberculosis is the complete failure of immunity which allows collections of tubercle bacilli to be set free and to establish everywhere new colonies. Miliary tuberculosis as studied in the lungs gives at the outset no signs and symptoms. It is invisible to the X-ray. In physical examination of the chest in a case in which the overwhelming of the vital forces is apparent day after day no signs are obtained. At last distant and faint atypical indeterminate râles are to be made out. By this time there is a characteristic restraint of the breathing. The lung expands slightly and ineffectually and on auscultation gives the impression of a body which moves slightly amid wet surroundings. If life is prolonged until softening of the tubercle has taken place the râles are more characteristic and nearer the ear and the X-ray gives evidence of a multitude of minute shadows.

Hematogenous disseminations of tubercle may be sparse or dense. Their characteristic feature is their irregularity of dissemination (Plate XI). Peribronchial tuberculosis is known at autopsy by the occurrence of "clover leaf" groupings of tubercle which represent sections of bronchi and bronchioles filled with caseous material or with pus. When section at autopsy shows thickly-set tubercles, in great part of the same size and equally placed, the condition is not miliary tuberculosis but the last stage of a bronchitis or bronchiolitis which is the termination of the most marked forms of peribronchial tuberculosis.

PLATE I. TUBERCLES OF UPPER LOBE CALCIFIED, OF LOWER LOBE FIBROUS

Lesion of lower lobe probably a sparse peribronchial tuberculosis which is practically cured.

PLATE II. UPPER LOBE CONVERTED INTO A FIBROUS MASS INTERSPERSED WITH MULTILOCULAR CAVITIES

More recent tuberculosis below, mostly of superficial part of lung. Note that the downward extension of the lesion appears to coincide with that of the pleuritic membrane.

PLATE III. UPPER LOBE A FIBROUS MASS WITH CAVITIES

Large caseous lesion at base, probably due to aspiration

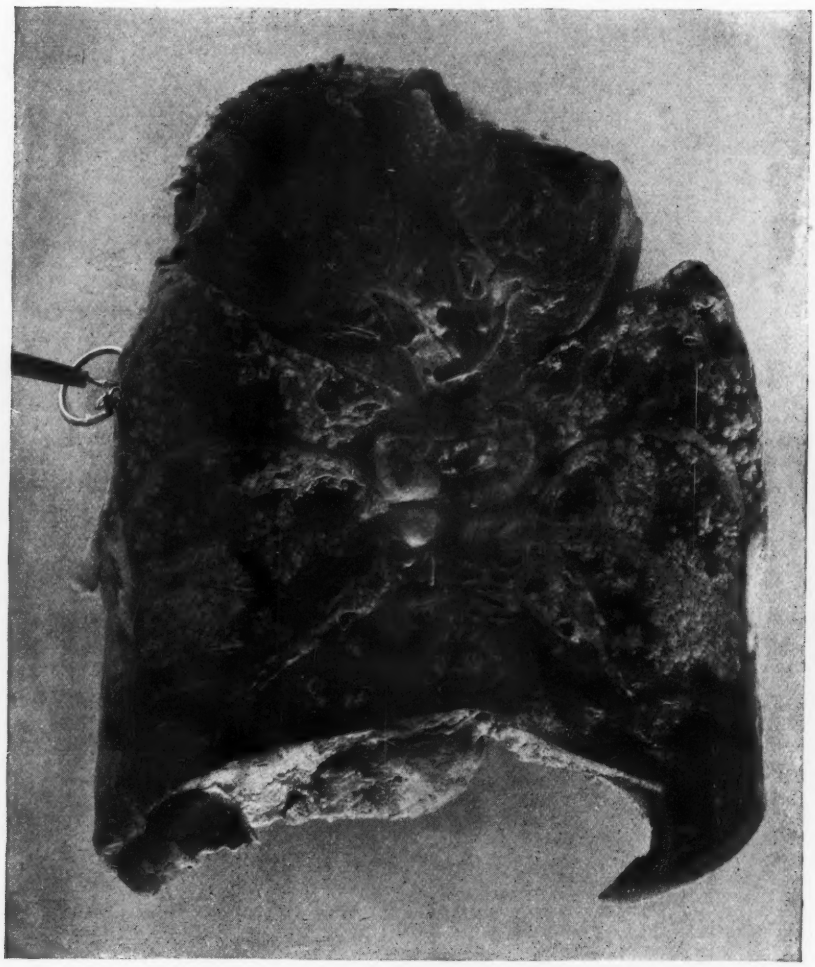

PLATE IV. FIBROUS UPPER LOBE WITH CAVITIES

In lower lobe peribronchial tuberculosis which has extensively invaded the parenchyma in lower portion. The fine-grained caseations are characteristic of tuberculosis of the acini, the terminal expansions of the bronchial tree.

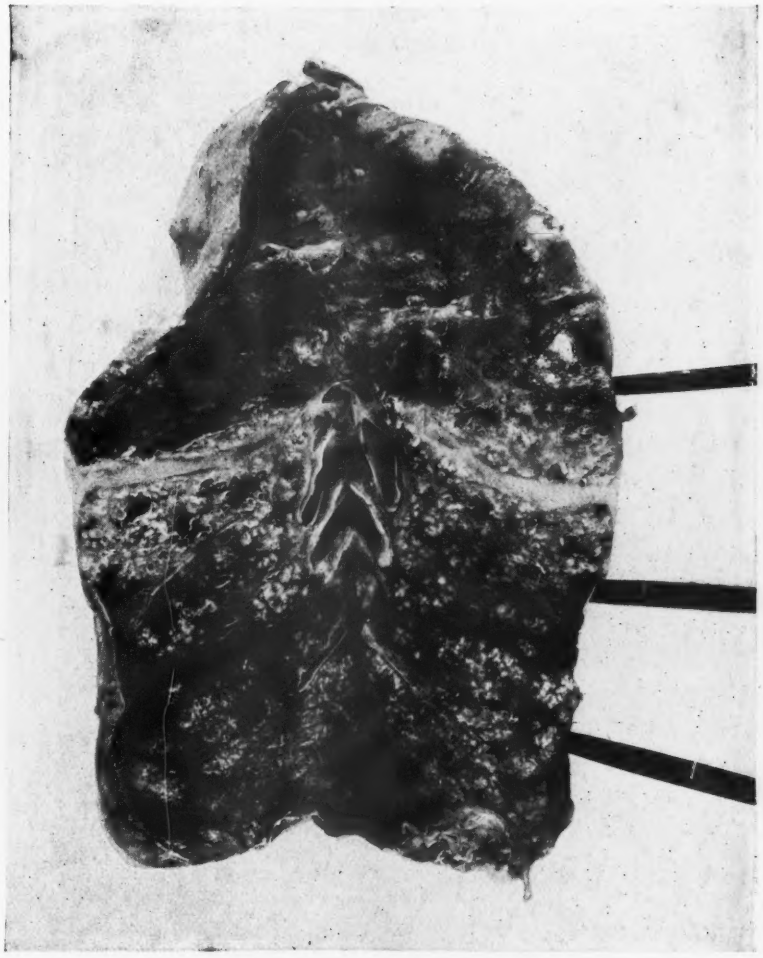

PLATE V. UPPER LOBE A DEFORMED MASS OF FIBROUS TISSUE, UNIVERSAL PLEURAL ADHESIONS OVER LOWER LOBE

Peribronchial extension throughout lobe.

PLATE VI. VERY OLD TUBERCULOSIS WITH SUBACUTE RECURRENCE

Calcified tubercle at apex, caseated tubercles of upper lobe. Areas of tuberculous pneumonia throughout. The portions which appear indistinct are areas of gelatinous pneumonia.

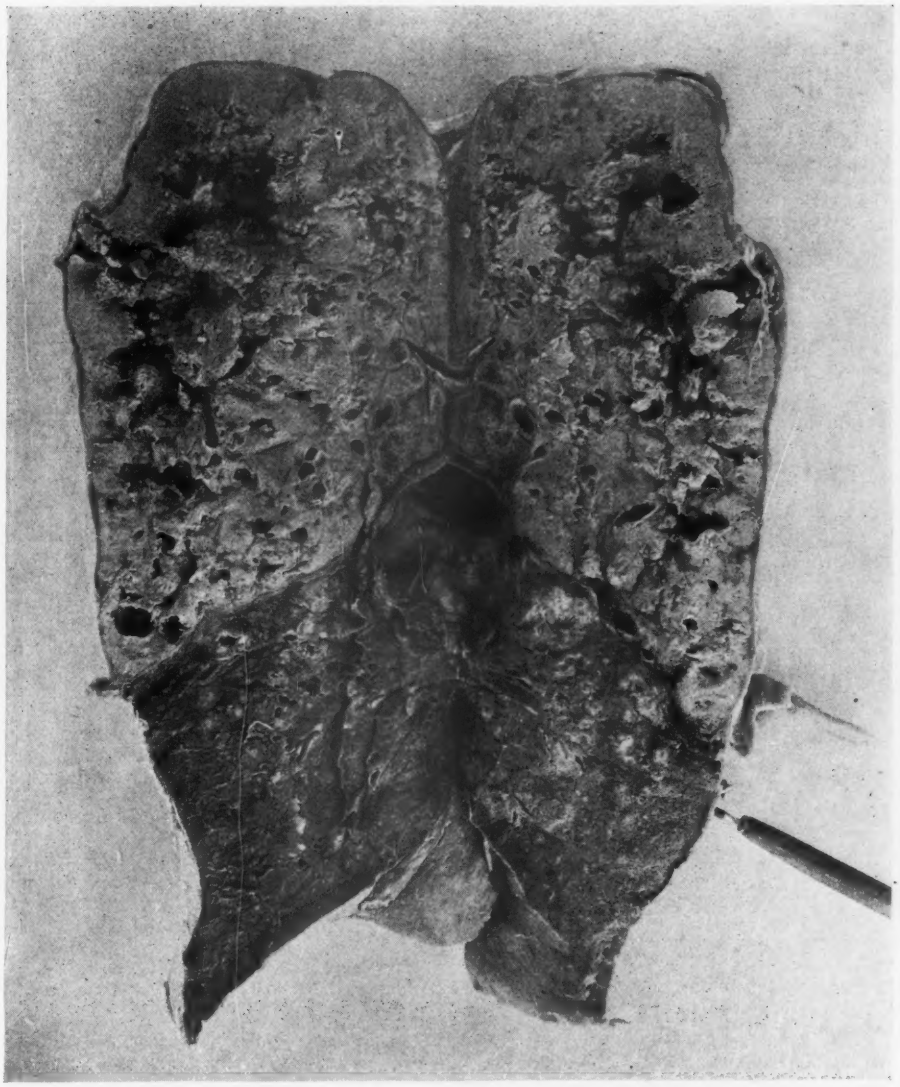

PLATE VII. THE ENTIRE UPPER LOBE IS CASEATED AS RESULT OF TUBERCULOUS PNEUMONIA

The comparatively healthy lower lobe has shrunk from immersion in alcohol. The upper lobe, having lost its elasticity, remains unaltered in size.

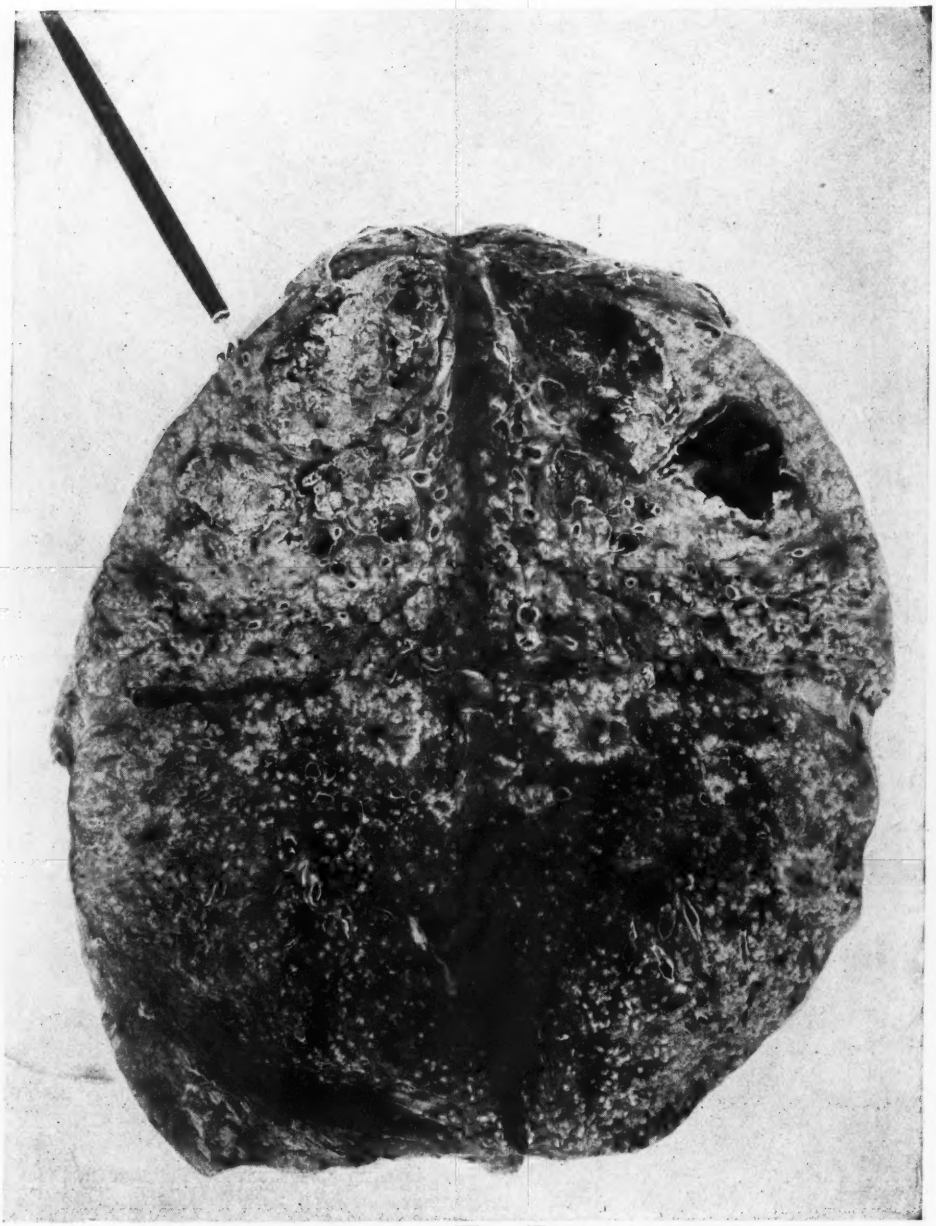

PLATE VIII. ILLUSTRATES IN UPPER LOBE THE FORMATION OF CAVITY FROM THE BREAKING DOWN OF CASEATIONS

In lower lobe miliary tuberculosis of rather chronic type.

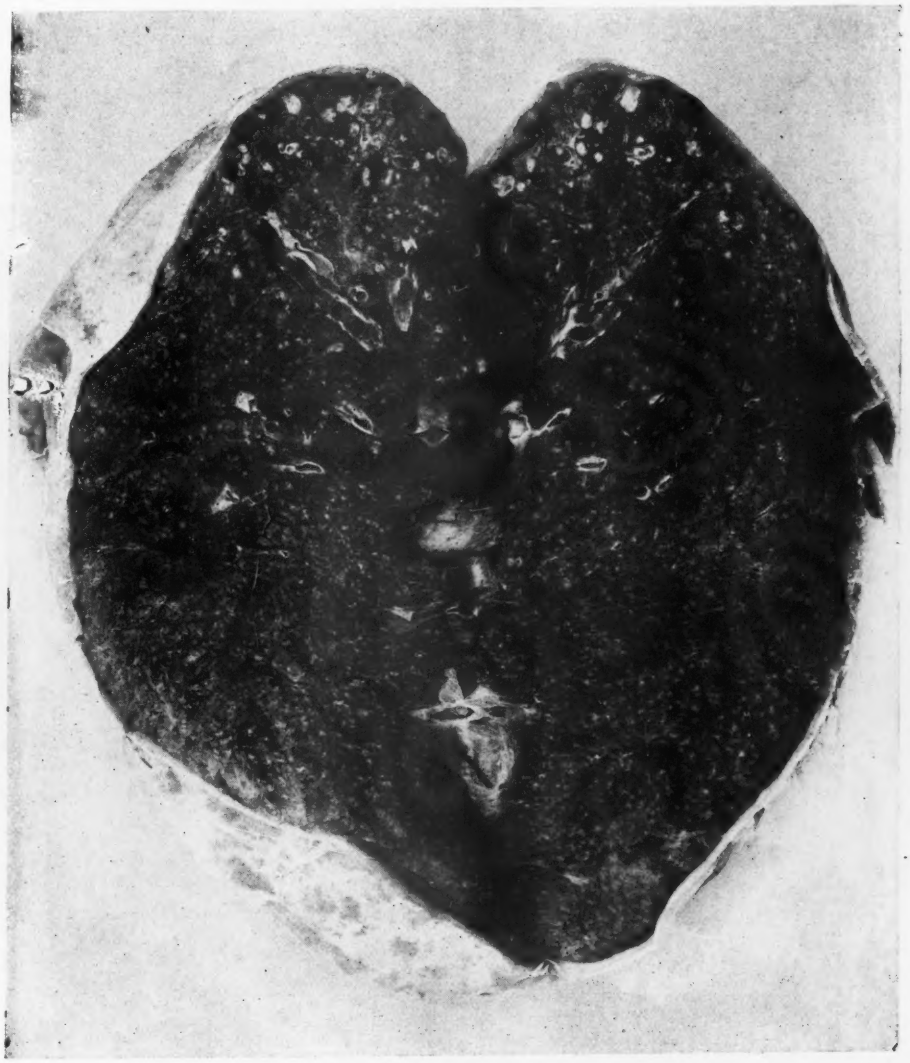

PLATE IX. OLD MOSTLY CALCIFIED TUBERCLES AT APEX. RECENT MILIARY TUBERCULOSIS OF ENTIRE LUNG

PLATE X. SMALL CAVITY AND A FEW OLD TUBERCLES AT APEX. RATHER RECENT MILIARY TUBERCULOSIS THROUGHOUT

PLATE XI. RECENT MILIARY TUBERCLES THROUGHOUT

The sparseness of the dissemination renders the irregularity of distribution apparent.

PLATE XII. ILLUSTRATES THE FORMATION OF CAVITY DEVELOPING AS AN ACUTE PROCESS

Lung studded thickly below with miliary tubercles which, as centers of pneumonic inflammation, project like knobs from the cut surface. Hence the name tubercle.

MEDICAL NOTES, ABSTRACTS AND REVIEWS

It will be the eventual purpose of the REVIEW thoroughly to canvass all literature on tuberculosis as it appears in other medical periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the Abstract Editor, Dr. George Mannheimer, 41 West 51st Street, New York, N. Y.

Calcification of the Lungs.—Harbitz has previously published some cases of calcium metastasis, calcium gout, and universal calcinosis. He here reviews these experiences and the literature on the subject and reports the details of a case in which both lungs were so full of calcium that it is surprising that they were able to work at all. The lungs weighed 6 times the normal weight and stood up on their own basis. The calcium was evenly distributed throughout, not in deposits around vessels. There had been no preceding destructive bone affection, so that the calcification was primary and not metastattic. Six other primary cases are on record which he cites in turn. In his case the kidneys were sound but there had been chronic gastritis with occasional hematemesis. The patient was a woman of forty-one with a history of acute articular rheumatism as a child and again three years before, and a chronic tendency to shortness of breath on exertion and to slight cyanosis. She entered the hospital on account of anasarca and ascites; the pulse was 104 and regular, respiration 34, inaudible. There were 8,448,000 reds and 11,600 white cells. Percussion showed resonance over the lungs with somewhat prolonged expiration and fine crepitation. The woman died in three weeks under the diagnosis of heart disease. The various theoretically possible causes for the extreme calcification of the lungs in this case are discussed, as nothing was found at necropsy to explain it.—*Extensive Calcification of the Lungs as a Distinct Disease, F. Harbitz, Arch. Int. Med., January, 1918, xxi, No. 1, 139.*

Primary Tumors of the Pleura.—The occurrence of primary tumors of the pleura has been denied, various writers claiming that these are always secondary to growths in the lung or elsewhere in the body. The authors have recently had an opportunity to observe 3 cases which they consider to be primary pleural tumors. The first occurred in a woman of seventy-five years and was found to be of the nature of a malignant lipoma originating in the pleura and forming metastases in the lung, liver and subcutaneous tissue. The second patient was a woman of fifty-one years who had a large tumor in the right pleura of sarcomatous nature, but without metastases. The third case was a man of fifty-seven years who had a large fibroma in the right pleura.

Tumors of the pleura may be divided into 3 groups, benign, malignant and intermediate, these last being of a benign nature, but later taking on active growth and becoming malignant. The symptoms of pleural tumors vary according to their character and evolution. Surgical treatment is sometimes possible in circumscribed growths and earlier diagnosis may make intervention more often possible and successful. A very full bibliography is given at the end of the article.—*Les tumeurs primitives de la plèvre, E. Pallasse and Ch. Roulier, Ann. de méd., May and June, 1916, iii, No. 3, 243.*

Broncho-Spirocheosis and Fungoid Bronchitis.—In 1916, 3 per cent of soldiers in a small Italian sanatorium were found to be non-tuberculous, but affected with a bronchial spirochetosis or more often bronchomycosis. The infecting organism, Spirochaeta bronchialis, was first described by Castellani in 1915, and later confirmed by other observers. The organism is polymorphic, 4 to 30 micra in length, 0.2 to 0.6 in thickness, having 2 to 8 spirals and pointed ends. The disease occurs in an acute, a chronic and intermediate forms. The chronic form is the most often confused with tuberculosis. Cough, mucopurulent expectoration, occasionally hemoptysis, lassitude, emaciation and slight fever are the main symptoms. The pulmonary signs are variable, being sometimes negative, sometimes coarse râles, areas of impaired resonance and crepitations, etc. Diagnosis is made by microscopic examination of the sputum, care being taken to eliminate the mouth spirochaetae. The fungoid bronchitis or bronchomycosis are frequent in the tropics, and are caused by the various hypomycetes. An-

other form, bronchohemisporosis, caused by the group hemispora is described briefly. *Notes sur la "Broncho-spirochétose" et les "Bronchites mycosiques," Aldo Castellani, Presse méd., July 25, 1917, No. 37, 377.*

Renal Tuberculosis.—Three cases are presented to show how difficult it is to recognize a tuberculous lesion in the kidney, even when the latter is bisected and its pelvis brought into view.

Case 1.—Male, 38 years old, admitted to the hospital with the usual symptoms of urinary tuberculosis, namely, frequent, burning urination, nocturia, and a cloudy purulent urine, containing tubercle bacilli. Cystoscopic findings were the usual ones of vesical tuberculosis, with polypoid oedema about the right ureter. The functional activity of the kidneys was normal, and tubercle bacilli were present only in the specimen from the right kidney. A diagnosis of right renal and vesical tuberculosis was made. A nephrectomy was done and the following lesions were found. Kidney normal, the ureter greatly thickened, densely adherent to the posterior parietes, and surrounded by a firm connective tissue mass, but nowhere showing tuberculous lesions. It was not until a number of sections had been made through hidden portions of the calyces that typical cheesy, necrotic tuberculous lesions were found, involving a calyx. True miliary tubercles were not present. These cheesy lesions are absolutely characteristic of tuberculosis, when they are present in the calyces, pelvis, or ureter. This case demonstrates beautifully the difficulty of macroscopic recognition of the lesions of renal tuberculosis.

Case 2.—This and the third case are kidney specimens, showing that in most cases the papillae are the first parts of the organ to be attacked. There was a thickening of the mucous membrane of the calyx and the area near the papilla, with several nodular protrusions. Close by there was a small oval ulcer. Elsewhere the pelvis seemed about normal, except at a point nearer the ureteral junction, where the pelvis and peripelvic fat showed considerable induration. Microscopically this proved to be an advanced tuberculous infiltration with cheesy degeneration and ulceration, with miliary tubercles.

Case 3.—This kidney specimen showed no evidence of tuberculosis. In one of the papillae of the upper pole and in the neighboring part of the calyx, there was a distinct tuberculous lesion, consisting of alterations in the tip of the papilla and involvement of the corresponding calyx. Histologically the solitary affected papilla showed the usual advanced tuberculous lesions, most extensive in the calyx.

That the peculiar cheesy lesions are characteristic of tuberculosis, even in the absence of specific histological changes, a study of many tuberculous kidneys and ureters has aptly demonstrated.—*Three Unusual Cases of Renal Tuberculosis, L. Buerger, N. York M. J., January 5, 1918, cvii, No. 1, 6.*

Tuberculosis of Urinary Organs.—The problem of whether the kidney should be extirpated provided the other kidney is in good condition is not so simple as was formerly considered. The tendency of the remaining kidney to the disease requires close attention and the most important points to settle as to the relative value of medical treatment and surgery in these cases are, according to the authors: "Do we judge correctly the significance of the symptoms and signs we attribute to it?" and "Do we read aright the results we obtain with the precise methods of examination of the urinary organs which are now at our command?" In other words, do we operate in some cases which had best be left alone, because of misconception of the significance of these symptoms and signs. To give more light on these points has been the aim of the authors in the observation and study of 600 cases of tuberculosis. The series of cases consists entirely of such as are likely to be met with in practice, rather than of necropsy findings after death. The patients under observation were 386 men and 214 women, all adults. They point out the difficulties that were met with and the routine observed in their examinations. "1. A note was made of all patients who gave a history of subjective symptoms referable to the genito-urinary tract, such as nocturnal and diurnal frequency of urination, tenesmus, etc. These numbered sixty-three (10.5 per cent of the total). 2. A twenty-four hour specimen of urine of each of the 600 patients under observation was examined by the usual routine method, and a separate search was made for acid-fast bacilli. 3. In all patients whose urine showed acid-fast bacilli, the bladder urine was drawn by catheter under rigid aseptic precautions, to guard against contamination of the urine by smegma bacilli, which are also acid-fast and otherwise resemble, morphologically, the tubercle bacillus, and which are often found in the anterior urethra in the male and are very commonly present on the external genitals of the female." The previous work on the subject is briefly discussed and reports of their own experience with cystoscopic examinations and animal inocu-

lation as well as search for associated tuberculous lesions, subjective symptoms, etc., are detailed. Frequency, painful urination, tenesmus, etc., do not prove the presence of discoverable lesions in the urinary tract. Hardly more than one-third of such cases presented adequate cause in their actual lesions for the symptoms observed. The symptoms as a rule are the results of the passing of irritating urine and as to the presence of tubercle bacilli many urines which show acid-fast bacilli by the microscope prove negative in animal inoculation tests. (The converse is infrequent.) Tubercle bacilli are often found in the urine without subjective symptoms or apparent lesions and tuberculosis of the bladder is frequent when there are no urinary bacilli. The tubercle bacilli are eliminated in showers and during the interval between these showers it is possible to get bacilli-free urine. Great care is needed in the diagnosis of tuberculosis of the kidney in view of the fact that tubercle bacilli are found in patients without demonstrable tuberculous lesions or symptoms. The finding of a few tubercle bacilli from the urine of a certain kidney is not sufficient to condemn that organ on the one hand, and on the other hand, the companion kidney may show tubercle bacilli in its urine at the next examination.—*The Urinary Tract in Pulmonary Tuberculosis: A Report of the Study of 600 Cases, S. W. Schapira, J. Wittenberg and S. L. Spiegelberg, J. Am. M. Ass., March 2, 1918, lxx, No. 9, 591.*

Curability of Chronic Renal Tuberculosis.—The meaning of "clinical healing" of renal tuberculosis is a complete disappearance of all signs and symptoms and a clearing up of urinary sediment, pus and bacilli with a return to normal health. The occurrence of such a cure cannot be decided with mathematical certainty, and its possibility is a matter of debate. Certain proof of the anatomic curability of renal tuberculosis does not establish the clinical healing. Evidence for or against may be by theoretical reasoning or by observed facts. Partisans of the clinical curability, mostly internists, have cited cases of definitely diagnosed renal tuberculosis which have improved, but these are rare. Their opponents, surgeons for the most part, bring forward cases which have become progressively worse and quote the brilliant results of operation. The latter are not justified in denying the curability of renal tuberculosis even if many unoperated cases die or if brilliant results follow nephrectomy. That spontaneous cure can result cannot be neglected or denied and is confirmed by pathological anatomical experience. Cases of renal tuberculosis may be divided into two classes. (1) Those which are acute and progressive and demand surgical interference without delay. (2) Those which are of long duration and do not present urgent symptoms, but rather show a tendency to subside. These latter are rare, but may be treated conservatively. It is impossible to speak of absolute cure and to guarantee that there will be no recurrence, as the primary focus from which the disease originally spread still remains and is a potential source of further infection even if the clinically diseased organ is completely and successfully removed. A more exact knowledge of the pathological anatomy of renal tuberculosis and a realization that this occurs in different forms is necessary. Closed parenchymatous tuberculosis is spontaneously curable and relatively benign. On the other hand, open tuberculosis of the pelvis is not spontaneously curable and is relatively malignant. There is a third form, a combination of the two or a development of the first into the second. The conclusion is forced upon us that these forms demand different methods of treatment, total nephrectomy in open cases, and medical treatment in the closed parenchymatous form. Medical treatment is also indicated in all cases before and after operation, in bilateral cases, and in those refusing operation. The distinction between the different pathological forms, the perfecting of medical treatment and of the indications for its employment should be the aim of future work. *Les conditions de curabilité de la tuberculose rénale chronique. Noël Hallé, Presse méd., November 8, 1917, No. 62, 633.*

Relation of Medical Tuberculosis to the Urine.—This report was suggested by the finding of tuberculous lesions in the bladder of a case of medical tuberculosis and by the uncertainty of finding tubercle bacilli in the urine of surgical urinary tuberculosis until late in the disease. The number of patients studied is small because tuberculous persons are reluctant to submit to detailed examination, especially when the investigation is concerned with the urinary system, in which they have noted no symptoms. Another source of objection by the patient is the discomfort of cystoscopy.

Information for this report was derived from 3 sources. First, tuberculous patients with no matter how trivial urinary symptoms were selected for study. The second source was obtained from correspondence with the different sanatoria, and the third from a study of the literature on this topic.

Fourteen cases of medical tuberculosis referred from the Health Department were

systematically studied. No tubercle bacilli were found in the urine of these cases on analysis and on the guinea pig test. The specific gravity was about normal. Only one case had a slight trace of albumin. Three had casts. The diazo and urochromogen tests are of no special value, because in the early stages they are untrustworthy and later they are unnecessary. Cystoscopic findings were negative in all but 2 cases. Two cases had a positive Wassermann.

From this and a study of the literature and the information obtained from sanatoria, the following résumé is derived: It is probable that in many cases of medical tuberculosis, tubercle bacilli are present in the urine from time to time, without causing symptoms. Many cases of tuberculous kidneys occur without any symptoms. There is no relationship between the severity of the symptoms and the extent of the kidney involvement. At any time silent renal tuberculosis may become active. Nephrectomy is the logical treatment for uncomplicated unilateral cases. Urogenital tuberculosis rarely causes death. Where death or lesions of urogenital tuberculosis have occurred a very large number had tuberculosis elsewhere, especially in the lungs.—*Relation of Medical Tuberculosis to the Urine, V. C. Pedersen, Urol. and Cut. Rev., September, 1917, xxi, No. 9, 481.*

Relationship of Certain Functional Symptoms of Femoral Hernia to Pulmonary Tuberculosis.—Femoral hernia often causes a syndrome of digestive symptoms from pinching of the intestine, namely, loss of appetite, nausea, retarded digestion and consequent loss of weight, as is seen in chronic appendicitis. This is quite different from the acute symptoms caused by strangulation. In addition to the dangers from such acute strangulation, these digestive disturbances can lower the resistance of the organism from improper nutrition and so favor the development of pulmonary tuberculosis in predisposed persons. The author has seen such a number of patients with pulmonary tuberculosis who also have a femoral hernia, that he has come to believe that there must be some relationship between these two conditions. Correction of the abdominal trouble and consequent improvement of digestion is followed by improvement in the pulmonary lesion.—*Notes sur quelques symptômes fonctionels propres a certaines hernie crur les et leur relation avec la tuberculose pulmonaire, Veyrassat, Rev. méd. d. l. Suisse Rom., January and February, 1917, xxxvii, No. 1, 56.*

Pregnancy and Pulmonary Tuberculosis.—The occurrence of pregnancy together with tuberculosis is frequent. It is a well recognized fact that among women the lung disorder often first manifests itself during pregnancy or shortly after childbirth. It is hard to explain this except by the added strain on the woman's resistance. The large number of women of child-bearing age dying of tube culosis every year shows the possibility of this complication of pregnancy. It is often unfortunately overlooked in its beginnings and while many women give a history of mild hemorrhages or pleuritic attacks, failure to conside the history of past illnesses may lead to disastrous results. Years ago, pregnancy was considered to exert a favorable influence on pulmonary tuberculosis, doubtless because of the fact that it is accompanied by an increase of weight, and because, during the early months of gestation, the influence of pregnancy on the lung disease is more favorable than in the latter half of pregnancy. The authors give a condensed summary of the most prominent articles in the literature, together with the statistics that have been collected. In this review of statistics, a certain number of cases of tuberculosis show exacerbations independent of pregnancy. Also, there is a deplorable lack of follow-up treatment by the maternity hospital physicians. When eighteen cases in the obstetric practice f one of the writers are reviewed, they confirm the statistics referred to. A review of the eighty-five cases, seen during the past five years at the Henry Phipps Institute, is tabulated and the cases are analyzed in detail. The important thing about this subject is the following out of the proper methods of observation and s udy as to what should be done with tuberculous pregnant women. Undoubtedly they should be advised against conception. Prior to the fifth month of pregnancy, the uterus should be emptied in all cases showing advanced or active lesions or laryngeal involvement. After the fifth month, there is little advantage in emptying the uterus, but labor should be made as easy as possible and premature labor is often advisable. Forceps should be used and special care be given to the question of anesthesia. In nonactive lesions of moderate grade, ether is advised as safest. The question of spinal anesthesia naturally arises. If there is any place for this method, it is certainly in cases of advanced pulmonary tuberculosis. The dangers of infection to the child are definite, and after delivery the danger to the mother is by no means over. The problem of the pregnant woman when tuberculous is often difficult and many sanatoriums and mater-

nity hospitals distinctly specify that they will not admit such patients. In the interest of these women, it is highly desirable that both the maternity hospitals and the tuberculosis sanatoriums should be encouraged to care for them. Pulmonary tuberculosis exerts little or no influence on conception or on the course of the physiologic process during early months. Marriage is worse for tuberculous women than tuberculous men, on account of the dangers mentioned. Unless the disease becomes quiescent, the women should be advised against marriage and, to a certain extent, against conception. Individual treatment is essential because no two cases are exactly alike. After the fifth month, it is generally advisable to treat these patients expectantly and induce premature labor two weeks before time. Hygienic and dietary treatment should be employed in all cases. In a great majority the tuberculosis precedes the pregnancy.—*Pregnancy and Pulmonary Tuberculosis, with a Report of 103 Cases, Ch. C. Norris and H. R. M. Landis, J. Am. M. Ass., February 9, 1918, lxx, No. 6, 362.*

Childbirth and Tuberculosis.—The Sea View Hospital, New York, makes special provisions for pregnant tuberculous women by setting apart a ward for their care. The idea was to make the ward a place in which sanatorium methods were used as much possible. After two weeks of observation during which the stage of the disease and the mode of sanatorium treatment were determined, the patient was transferred to the obstetric ward and there the care was the same as for all tuberculous patients. When labor occurred the woman was removed to the surgical pavilion, for reasons of asepsis and brought back to the obstetric ward shortly afterward and placed in a single room for two or more weeks and treated like any other maternity patient. Immediately after labor the child was removed to the children's pavilion and artificially fed from birth. A number of cases are briefly reported, the duration of the tuberculosis being that mentioned by the patient. During pregnancy, as nearly as could be ascertained, ten of these patients seemed to retrograde, and five to improve, and the condition of three was apparently unchanged. After labor, the condition of the moderately advanced seven was improved. Of the far advanced, five died, one improved, and five retrograded. While conclusions cannot be drawn from so small a number of cases a the eighteen reported some general impressions are given as to the advantages of the method. Of course, there are some disadvantages such as the separation of the mother and infant and the artificial feeding, but the danger of infection during nursing and fondling are thus avoided. The effects of pregnancy and labor on the course of tuberculosis are problematic. The less advanced the tuberculous disease, the better for the mother, as a rule. It is difficult, however, to foretell in any individual case what the outcome will be. The question of the termination of pregnancy in the tuberculous has been considerably discussed and different views expressed. Perhaps the best way to consider the subject is to imagine one's self in the position of the tuberculous woman, and then decide.—*Childbirths and Tuberculosis, E. S. McSweeny and S. L. Wang, J. Am. M. Ass., February 9, 1918, lxx, No. 6, 368.*

Inherited Syphilis and Surgical Tuberculosis.—It was noticed in the tuberculosis dispensary at Naples that tuberculosis of the bones often develops in persons with inherited syphilis. The findings in 70 children from two to thirteen years old with Pott's disease or other tuberculous affection of bones or joints are tabulated. They show that in 72.3 per cent inherited syphilis was beyond question. This demonstrates the importance of antisyphilitic treatment, in addition to the measures addressed to the tuberculosis. The experience with this combined treatment was quite encouraging. —*Inherited Syphilis as Basis for Tuberculosis of Bones, G. Caronia and R. K. Marinucci, Pediatria, December, 1917, xxv, No. 12, 713.*

Syphilis and Tuberculosis.—Until recently, the diagnosis of tuberculous joint disease was considered one of the simplest problems with which the orthopedic surgeon has to deal. Those cases characterized by gradual onset of symptoms, the presence of spasm on passive movement, limitation of movement in all directions, and limp and atrophy, if a weight bearing joint was involved, or change of attitude when the spine was involved, were usually considered as probably tuberculous. In view of recently acquired knowledge, it is hard to understand why tuberculosis is accepted as the most probable etiologic factor in the production of the clinical picture mentioned. The literature on joint lesions of inherited syphilis is very limited and there exists an extensive group of syphilitic invasions still unrecognized in orthopedic textbooks. It is not always easy to draw a definite line between syphilis and tuberculosis of the joints. The Wassermann test often fails us. The best way to attack this problem of the cause of joint disease in children would be first to

eliminate syphilis. The family history should be thoroughly studied. We should search for a history of skin diseases and rashes, supposed attacks of rheumatism, etc. There is one field of observation which can furnish convincing evidence, and that is the teeth. Hutchinson's notched teeth are not the only sign of syphilis, but only one of its manifestations. The writer considers the most frequent symptom to be the widely separated incisors, either upper or lower, and irregularities on the lingual surface of the upper molars, which are illustrated in cases he reports, selected from a series of 100. In these, the only clue to the probable etiology of the joint lesion was furnished by the teeth, and the therapeutic test of specific treatment corroborated. The writer is now preparing an additional report of 100 cases including other orthopedic conditions. In it the results of a comprehensive series of Wassermann tests will be submitted.—*Syphilitic Joint Disease Simulating Tuberculosis, P. W. Roberts, J. Am. M. Ass., February 9, 1918, lxx, No. 6, 372.*

Pyopneumothorax and Pneumothorax.—Honeij reports a case of pneumothorax and one of pyopneumothorax. The first is a woman, aged 27, with history of slight attack of vomiting and loss of weight; no chest pain. X-ray showed collapsed left lung, compressed right lung, displaced heart, pushed down diaphragm on the left and raised diaphragm on the right.

The second case, one of pyopneumothorax, was a man, aged 51 years, complaining of pain in the left chest and shortness of breath, the latter having lasted five weeks. Both apices were sunken, clavicles prominent, dulness, harsh breathing and râles at right apex, tactile fremitus in the right axilla increased, Grocco's sign at the right base. On the left side dulness from the ninth spine downward modified with patient lying on the right side, visible and palpable pulsation of the chest in the left postaxillary line from the middle of the scapula to the base; and the heart displaced to the right. There was partial delirium; the patient being difficult to control and examine. He had frequent paroxysms of pain in the lower left chest. Roentgen examination showed the heart displaced to the right from the first rib gradually down to the base. There were shadows in the right lung and the diaphragm on this side was low; the left lung showed marked density and mottling at the apex down to the first space, where it was sharply demarcated by a dense semicircular line arising at the hilus region and running upward and outward to the axilla. Below this line there was a transparent area extending down to the fifth rib. Below the fifth rib there was great density. On fluoroscopic examination slight movement of the surface line of the fluid was noticed on inspiration. On aspiration foul smelling pus was obtained. Rib resection was performed and revealed about 1000 cc. of pus, normal collapsed upper lobe, partially infiltrated and partially destroyed lower lobe, heart displaced to the right, and a small amount of clear fluid in the pericardium. The patient died on the day of operation.—*Pyopneumothorax and Pneumothorax, J. A. Honeij, Arch. Int. Med., October, 1917, xx, No. 4, 629.*

Tuberculosis in Carnivorous Animals.—The author has made extensive observations on tuberculosis in both domestic and wild carnivora, and seems to have established certain facts. In their general character the lesions correspond very closely to those of the human subject, and the bacillus is morphologically similar to that of the human infection. Chronic tuberculous lesions are much less frequent in wild carnivorous animals in confinement. Healed lesions have been frequently observed in the lungs of dogs, but the author has never noted any evidences of the pronounced fibroid changes of pulmonary tuberculosis in any of the wild species of carnivorous animals. He infers that the disease is of a more virulent type in carnivores than in the human subject. From his observations on tuberculosis in wild animals, Blair is thoroughly convinced that the offspring of wild animals in captivity are less liable to succumb to the infection than are animals coming direct from the jungle, assuming the conditions of infection and environment to be the same. In the diagnosis of tuberculosis in carnivores great importance should be attached to any enlargement of the lymph glands. While this enlargement may occur as an independent affection, it is usually an indication of tuberculosis of some abdominal organ. Tuberculin has been used to some extent for diagnostic purposes in dogs, but the result has not been satisfactory. The injection of tuberculin fails in about 40 per cent of cases, and it is dangerous, since it may intoxicate or even cause death. In cats tuberculin is also uncertain, and may be dangerous in animals free from the disease. Tuberculosis in carnivorous animals, and especially in the domestic dog and cat, is more frequent in cities than in country districts, and this is believed to be due to the fact that city animals are more confined, and the opportunity of infection from human sources

is so much greater.—*Tuberculosis in Carnivorous Animals, W. R. Blair, J. Am. Vet. Ass., September, 1917, li, No. 6, 750 (from Vet. Review, February, 1918, ii, No. 1, 79).*

Tuberculosis in Camels.—Tuberculosis is very rare in camels in all countries except Egypt. The constancy of the occurrence of bovine bacilli in tuberculous lesions in camels supports the view that infection is derived from cattle, and the method of infection is by inhalation. Apparently the lungs never escape infection.

Tuberculosis in camels generally is chronic but progressive. Under adverse conditions, however, such as continuous transport work in the desert, wasting occurs rapidly, with all the symptoms seen in bovines. Giant cells are rarely found in the lesions, otherwise the microscopic structure is that of tuberculous lesions in general. Calcification sets in early. Frequently much fibrous tissue is found in connection with the older lesions.

For diagnostic purposes the subcutaneous test with ordinary tuberculin may be used.

Mason gives the following figures respecting the variations in the normal temperature he has observed in a large number of healthy camels at rest: Extreme variation between early morning and late afternoon, from 35°C. to 38.6°C. At 6 a.m. 36°C. to 37.5°C.; usual temperature 36.2°C. At 6 p.m. 37.4°C. to 38.6°C. A temperature over 37.5°C. at 9 a.m. and over 38.7°C. at 6 p.m. is abnormal. Mason's observations on temperature agree with those previously published by Leese.—*Tuberculosis in Camels, F. E. Mason, J. Comp. Path. and Therap., xxx, Part 1, March, 1917 (from Vet. Review, 1, No. 4, November, 1917 423).*

Tuberculous Mastitis in the Cow.—The author discusses the three views respecting the route of infection of the mammary gland, namely, (1) by way of the milk canals; (2) by the blood stream from a pre-existing focus; and (3) by way of the lymphatics from some tuberculous lesion in the abdomen. Against the theory of embolic infection are certain features of mammary tuberculosis: (1) The disease, as a rule, begins in one quarter of the udder, and not in all four quarters. (2) In the great majority of cases it is a hindquarter which is first attacked. (3) The disease generally appears to have begun at the upper part of a quarter. (4) As a rule the lesions do not appear to develop from separate discrete centers in the quarter first attacked. (5) In certain cases, which are by no means rare, the supramammary lymph glands are found to be visibly tuberculous while the entire udder tissue appears to be normal. The lymphatic theory, on the contrary, affords a perfectly satisfactory explanation of the whole of these facts. Infection through the teat canal is possible but rare. Attention is called to the common error in supposing that tuberculous mastitis is a nodular disease, and that consequently palpation of a suspected udder should be directed to the detection of firm nodules. The disease is diffuse, and increased solidity and firmness, without the formation of actual tubercles, are the most constant characters of the lesions. Histologically, the lesions of tuberculous mastitis usually pass through five stages: (1) Stage of cellular infiltration is marked by the appearance of increasing numbers of free-lying cells in the interacinous spaces. (2) The second stage begins when the cellular infiltration is reaching its height, and during it there is a more or less rapid obliteration of the normal histological features. The author calls this the histolytic stage. (3) The third or symplasma stage is the most characteristic of tuberculous lesions. It is marked by the irregular fusion of the cytoplasm of all the cells at the place where the change is occurring. Degenerative changes occur in the nuclei and the cytoplasm often shrinks away from them. The symplasma is mainly composed of the bodies of the foreign cells, but persisting epithelial cells of the acini and remains of capillary walls or of connective tissue are incorporated with it. (4) The fourth stage is that of giant-cell formation. (5) The fifth stage begins with actual necrosis, and, if time is allowed, goes on to caseation and calcification.—*Tuberculous Mastitis in the Cow, Its Pathogenesis and Morbid Anatomy and Histology, Sir J. M'Fadyean, J. Comp. Path. and Therap., xxx, Part 1, March, 1917 (from Vet. Review, November, 1917, 1, No. 4, 424).*

Tubercle Bacilli in the Feces of Cattle.—This research is a preliminary to testing the viability of the tubercle bacillus when excreted on pasture land in the feces of cows. Incidentally it revealed a means whereby milk may become infected with tubercle bacilli from dung. To test the excretion of bacilli, guinea pigs were inoculated with an emulsion of the feces. In all, samples of the feces of 179 cows were examined, but for various reasons some of these were excluded from the final results. After such exclusions it was found that virulent tubercle bacilli were present in the feces in 3 cows out of 158. It is possible hat one of these infecting cows should also be excluded as she had been operated upon for

tuberculous glands in the neck twelve months before the sample of feces was taken and was again obviously unwell. If then this animal be also excluded, there remain two apparently sound cows whose feces infected guinea pigs with tuberculosis from among 157 which were examined.

By other methods it is possible that other cows might have been found to excrete tubercle bacilli in their feces. Only one sample was taken from any animal and the sample represented only a very small fraction of the total daily excrement. Moreover, only a fraction of the sample taken could be inoculated into guinea-pigs.—*Presence of Tubercle Bacilli in the Feces of Cattle in Dairy Herds, R. S. Williams, W. M. Scott, T. Roberts and W. A. Hoy, Vet. News, April 28, 1917, xlv, No. 695 (from Vet. Review, November, 1917, 1, No. 4).*

Culture Methods for the Isolation of Tubercle Bacillus.—The isolation and pure cultivation of he tubercle bacillus has from the time of Koch's earliest discoveries been best attained after passage through a guinea pig. Contamination has been too frequent when endeavoring to procure cultures of tubercle bacilli from sputum or tissue in any other manner. A solution of this difficulty was expected in the introduction of antiformin; but this method was soon discarded by bacteriologists. In recent years efforts have been directed to discover a culture medium which would inhibit the growth of extraneous organisms, while permitting the growth of B. tuberculosis. Williams and Burdick report the history of this effort.

Von Drigalski and Conradi (1902) observed that crystal violet could inhibit the growth of many bacteria when added to the culture medium; but had no effect on the culture of typhoid or colon bacilli. Churchman (1912) discovered that gentian violet possessed an unusual merit in such selection. By adding gentian violet (0.001 per cent) to his culture medium, Churchman purified a culture of B. tuberculosis that had become contaminated with B. subtilis. He states that B. tuberculosis is "gentian-negative," whereas B. subtilis is "gentian-positive," the effect of the gentian being described as "bacteriostatic" rather than bactericidal. Petroff (1915), working with this as a basis, devised a medium composed of meat juice, glycerine, and egg, to which was added minute amounts of gential violet. Williams and Burdick (1916), among other objections, found that Petroff's medium did not contain enough moisture to prevent rapid drying. They, therefore, devised a new culture medium for the tubercle bacillus. Williams and Burdick approved the use of sodium hydroxide and gentian violet as suggested by Petroff; but employed, as the substance of their medium, egg white, egg yolk, glycerine, meat infusion and agar, a medium on which Besredka had advised the growing of the bacillus for the production of an antigen suitable for tuberculosis complement-fixation tests. Some workers have, we understand, found that the medium of Williams and Burdick also has too rapid a tendency to dry out.

A. S. Griffith, who had so vast an experience in the investigations of the British Royal Commission on Tuberculosis, would seem to have perfected methods of isolating the tubercle bacillus by the aid of antiformin. Some time ago Griffith found that the presence of a small quantity of antiformin in the fluid used for sowing cultures did not interfere with the growth of the tubercle bacillus. He, therefore, merely sowed successive cultures from a mixture of sputum and antiformin after varying intervals. Griffith concludes from his most recent work with animal tissues as well as with sputum, "that it is more advantageous, especially when dealing with tenacious sputum, to use high percentage of antiformin with short exposure, than low percentage with long exposure."

Griffith (quoted by Cobbett) now makes a 15 per cent addition of antiformin to sputum. "The first sowing should be made one or two minutes after mixture, according to the consistency of the sputum, and three tubes at least ought to be sown within the first five minutes. Thereafter the intervals may be longer—about five minutes, especially if the sputum remains undissolved and mucinous. There is no need to sow tubes after twenty minutes or after the sputum has completely dissolved.—*Editorial, J. Lab. and Clin. M., December, 1917, iii, No. 3, 207.*

Petroff's Method for the Isolation of Tubercle Bacilli.—Petroff's medium is prepared easily. It consists of whole egg two parts, fresh meat juice one part, glycerol 5 per cent, and gentian violet 1: 10,000. It is heated at 85°C. until coagulated and for an hour at 75°C. on the two succeeding days. The sputum to be examined is digested with an equal mount of 3 per cent sodium hydrate at 37°C. from twenty to thirty minutes. The mixture is then neutralized with normal hydrochloric acid and centrifuged. The sediment is then spread over the surface of the above medium. Thirty-seven specimens have been examined by the author, all were pronounced positive by microscopic examination. From twenty-four of them or 64.8 per cent, tubercle

bacilli were isolated. The shortest time required for visible growth was two weeks, the average three to four weeks.

Petroff's method may be applied successfully to the examination of milk. With slight modifications it should prove constant and reliable. Thirteen samples of milk were artificially infected with tubercle bacilli, 4 with the human, and 9 with the bovine type. Nine or 69.2 per cent positive isolations were made. Fifty-nine samples of milk obtained through the New Haven Health Department were examined. Of these five or 8.4 per cent yielded positive growth. Twenty-nine samples of milk from the State Bacteriological Laboratory gave negative results. All the guinea pigs except one which were used as control animals died without any visible signs of tuberculosis. The colonies which appeared on the medium from the milk were usually small and few in number. However, bacilli were always found in great numbers. The organisms isolated were of the bovine type, and it further appears from the investigation that glycocoll or asparagin favors their growth.—*A Note On Petroff's Cultural Method for the Isolation of Tubercle Bacilli from Sputum and its Application to the Examination of Milk, F. C. Stewart, J. Exper. M., December 1, 1917, xxvi, No. 6, 755.*

Potentiometer Curves of Bacilli Cultures.—The potentiometer curves correspond with the Smith curves. For differentiation of type, the same discrepancies occur as with the Smith test, the human type giving a bovine curve or vice versa. For differentiation of type, therefore, the value of the potentiometer test is not commensurate with the labor and cost of determining the reaction.—*The Glycerine Bouillon Curve of Tubercle Bacilli as recorded by the Bovie Potentiometer, Langdon Frothingham, J. Med. Research, November, 1917, xxxvii, 269.*

Action of Gland Extracts on Tubercle Bacilli.—For several reasons the extent to which animal tissues are capable of destroying the tubercle bacillus is of importance. Perhaps the best demonstration of antituberculous power on the part of the tissues is afforded by the selective tendency so characteristic of tuberculous infection. One species is preferred to another species; one organ to another organ. Take, for example, the comparative immunity enjoyed by the rabbit's liver in comparison with its highly susceptible lungs, or the remarkable rarity of tuberculosis in the sheep in comparison with its frequency in the ox. The author employed extracts from a number of different organs derived from the human subject, the ox, sheep, pig, cat, rabbit, and guinea pig. The extracts were made in accordance with the simple method recommended by Kanitz (Ztsch. f. Physiol. Chem., 1905, xlvi, 482). The results obtained point to a consistent relationship between lipolytic activity and bacteriolytic power on tubercle bacilli. The least bactericidal extract was lung extract; the most powerful was pancreas extract. Liver, thymus, and lymphatic glands were strongly bactericidal. Other organs—suprarenal glands, pig and cat spleen, human and cat kidney, human and ox brain, ox thyroid, cat lung, ox bone marrow, and ox pituitary glands—were found to be bactericidal to a lesser degree. No difference was noticed between bovine and human tubercle bacilli on susceptibility to any gland extract examined.—*The Bacteriolytic Action of Gland Extracts on Tubercle Bacilli, A. E. Porter, J. Hyg., July, 1917, xvi, No. 1, 55 (from Vet. Review, February, 1918, ii, No. 1, 81).*

Complement Fixation.—One hundred serums have been tested for complement fixation with Miller and Zinsser's antigen. Fifty-six of them were syphilitic and nine of these gave positive fixation for tuberculosis, but also a strongly positive Wassermann. Eight known tuberculous serums gave negative reactions. Three of these were knee affections, one a tuberculous spine, and four advanced cases of pulmonary tuberculosis. Twenty-three cases were suspected as being infected, but no definite signs could be found. Of these, twelve were positive and eleven negative. One case of meningitis was positive and was found later to be tuberculous by guinea pig inoculation. One case of pulmonary trouble had been watched for six weeks with no diagnosis and gave a positive reaction. The tubercle bacillus was found in the sputum following the day of the report on the serum. Old serums do not work as well as the fresh. The results should be read in less than two hours as suggested by Craig. The test promises to be of great value in determining when a patient is cured of tuberculosis.—*Complement Fixation Test for Tuberculosis, C. L. Shields, Northwest Med., December, 1917, xvi, No. 12, 364.*

Complement Fixation in Tuberculosis.—Miller's antigen gives no positive reactions with non-tuberculous sera. Known positive cases give a very high percentage of positive reactions. A negative reaction in a known tuberculous case is a danger signal. Luetics with positive tuberculous fixations should be considered tuberculous. In all

doubtful cases the reactions are of great diagnostic value. The advantages of Miller's antigen are its ease of preparation and the great possibility for polyvalence. Five hundred and fifty reactions are reported by the author on sera furnished by private physicians. On the basis of the data given by the doctors, the cases are separated into five classes: (1) Cases clinically free from tuberculosis. Eighty-seven sera were examined, all of which gave negative reactions. (2) Definite tuberculous cases, showing tubercle bacilli. One hundred and fifty sera were examined, of which 138 or 92 per cent were positive. (3) Cases clinically tuberculous, but showing no bacilli. Ninety sera were examined, of which 72 or 80 per cent were positive. (4) Arrested tuberculosis. Twenty-six sera were examined, of which 3 were positive, giving 81.5 per cent of negative reactions. (5) Possible tuberculosis. Two hundred and seven sera were examined, of which 80 or 25 per cent were positive and 127 or 75 per cent were negative.—*The Complement Fixation Reaction in Tuberculosis, C. N. Boynton, Southwest. Med., January. 1918, ii, No. 1, 9.*

Complement Fixation in Tuberculosis.—The complement fixation test has one thing in common with the tuberculin test. The majority of lethal and late third stage cases show a negative reaction probably due to the fact that in this stage there is no new antibody formation and that the circulating antibody is taken up as formed by the combination which may and does greatly increase during the last stage of the disease. Besredka obtained from 90 to 95 per cent positive results in clinical tuberculosis. The advantages of Miller's antigen is that it keeps better and saves labor. Bronfenbrenner obtained 84 per cent positive results in first stage tuberculosis; 94 per cent in second stage, and only 15.3 per cent in third stage. The test indicates active tuberculosis and more so when repeated at intervals of one month for two or three times. There are cases that are negative now and positive one month later and again negative the third month. These are border-line cases and need watching. Arrested and cured cases show a negative reaction so do most late third-stage cases.

A review of 220 cases was studied. Cases with tuberculous glands or bones showed a higher percentage of 4 plus human type than pulmonary cases. This holds good in bovine type also. The third stage cases that were positive were all early third stage cases; all late third stage cases were negative. Lues nowhere interfered with the tuberculosis deviation test, since those that reacted to both tests showed unmistakable signs of tuberculosis. The biologically treated cases became negative in 82 per cent.—*Observations on Complement Fixation in Tuberculosis, Wm. Meyer, Med. Rec., February 2, 1918, xciii, No. 5, 193.*

Complement Fixation with Besredka's Antigen.—Several laboratories have confirmed the successful results obtained by Besredka and Manoukhine in their preliminary experiments. The complement deviation with Besredka's tuberculin gives from 90 to 95 per cent positive results in clinical tuberculosis, while in cases where no tuberculosis could be detected clinically the results were negative, except in less than 10 per cent of cases. This antigen consists of an autoclaved filtered culture of the tubercle bacillus grown on a medium of alkaline broth to which is added egg white and yolk. It was found, however, that different tuberculous sera display a certain strain specificity. Thus, among 50 cases of diagnosed tuberculosis only 18 gave fixation with every one of the three samples of Besredka's tuberculin employed. Twenty-six cases gave fixation with two samples, and in two cases fixation was obtained only with one sample.

With a purified sample of Besredka's antigen the following results were obtained: First stage, 84 per cent; second stage, 94 per cent; third stage, 15.3 per cent. In clinically non-tuberculous, non-syphilitic cases, fixation was obtained in 5 per cent of cases. As regards the low percentage of positive results obtained in far advanced tuberculosis, a special study was undertaken and the results were generally the same when other antigens were employed, viz.: Craig's, Corper's, Calmette's and Miller's antigens.—*On the Complement-Fixation Test in Tuberculosis with Besredka's Antigen, J. Bronfenbrenner, J. Lab. and Clin. Med., October, 1917, iii, No. 1, 51.*

Complement Fixation.—The author cannot agree with those who consider the subcutaneous injection of old tuberculin an entirely safe procedure. If the injections are given in doses so small that no deleterious results can be produced, we may fail in clinically active cases to obtain a definitely recognizable reaction, and then if repeated doses are increased very slowly, immunization may occur. Whenever a reaction does occur there is at least a transient lowering of resistance, which corresponds to Wright's negative phase. In many cases the succeeding positive phase counteracts this disadvantage, but in some cases definite harm may ensue. While the large majority of

clinically active cases will give a positive reaction, the test is contraindicated in cases with fever, and in cases with lower resistance the test is negative. In about 56 per cent only of non-suspected cases, according to Simon, is a positive reaction obtained. Finally in some cases which show no focus either before or after the test the reaction is positive. The tuberculin test is therefore neither safe nor reliable. In the complement fixation test, however, the complement is said to be bound by an antibody which is absolutely specific and which is produced by the antigenic effect of the tubercle bacilli toxin. The results seem to depend somewhat on the nature of the antigen used. The antigens as classified by Miller consist of either of the following groups: bacillary suspensions, tuberculins or filtrates, bacillary extracts, and tissue antigens. Whether the Besredka, the Miller, or the Craig antigen be used the complement fixation test is probably as reliable as and much more widely applicable than the subcutaneous test without the hazards of the latter. The tuberculosis antigen will not fix the complement in the presence of syphilitic lipoid antibodies unless tuberculous antibodies are also actually present. Cross fixations with the Wassermann test mean both tuberculous and syphilitic foci.—*The Complement-Fixatin Test in the Diagnosis of Tuberculosis, With a Study of 135 Cases, G. W. McCaskey, Am. J. Med. Sc., November, 1917, cliv, No. 5. 648.*

The Wassermann Reaction and Tuberculosis.—Only a persistently positive Wassermann should make one certain of the presence of syphilis in a patient suffering from pulmonary tuberculosis. This conclusion is arrived at after subjecting 328 tuberculous patients at the Gaylord Farm Sanatorium to the Wassermann test for which a cholesterinized antigen, in most cases an acetone-insoluble antigen, and a plain alcoholic extract of guinea-pig's heart as a control, were employed. Tuberculosis will not give a positive reaction persistently, in the absence of lues. Of the 328 patients whose sera were tested, 302 or 92 per cent gave a negative result on the first examination. Sixteen or 5 per cent gave a one or two plus on the first test, but were negative the following week and always thereafter. Three that were three plus on the first test were reported negative two weeks after and persisted negative. Only seven or 2 per cent were persistently positive and they gave three or four plus reactions on the first examination. Five of these persistently positive cases gave a positive history of lues, while in two cases no history could be obtained.—*The Wassermann Reaction and Pulmonary Tuberculosis, J. S. Ford, Med. Rec., October 20, 1917, xcii, No. 16, 678.*

Problems in Tuberculosis.—There are three main classes of problems that may be taken as applying to all diseases to a greater or less degree: (1) The fundamental causes for disease, their origin and reasons for their existence; (2) resistance to disease, natural and acquired; (3) the best methods of prevention and treatment. Painstaking study has been made and is still in progress to recognize the nature of virulence, the disease producing powers of the tubercle bacilli. The body also has to be adapted in some way to form a culture-ground for the germs. A more fundamental study of heredity is important, which shall consist of a comparison between families who have had the disease with those who escape. There are also broad problems of race, soil, climate, geographic position, diet and habits, as well as chemical and, possibly, physiological functions, that are closely connected with the development of the disease. Another question to be answered is: What becomes of the children who recover from a bovine infection? Do they form many of the victims of pulmonary tuberculosis who later acquire the human type of infection? The frequency of adult infection appears to be relatively small. On the other hand early infections very frequently never spread, leaving one to suspect a second infection as the cause of the ultimate disease.

Resistance to tuberculosis is not immunity in the absolute sense. It is natural or inherited in part, acquired gradually with growth and aided to some extent in many people by slight infection. It may be broken down by other diseases, by all the hardships of life, by exposure and strain of war, as well as by underfeeding.

In the prevention of the disease, sputum prophylaxis is the chief end of all measures taken to destroy the bacilli. Were it possible to destroy all sputum as soon as it is expelled, a long step would be taken in prevention of tuberculosis. A marked drop in tuberculosis mortality might be expected, if all coughing without covering the mouth could be stopped and if handkerchiefs could be abolished and the hands of patients kept clean.

As regards treatment, protective inoculation has not yet proved satisfactory. Laboratory workers are now trying to find a drug which will destroy the bacillus in the body. Until such goal is reached the treatment of tuberculosis in the individual patient should resemble the methods of nature; nor should we interfere too much with

Nature by administering depressing drugs. Rest is the first requisite in active or progressive disease. It is well supported by experience and experiment. Food in abundance and variety; we have no better medicine. Fresh air and light, also in abundance. During convalescence or quiescence, regulated exercise. Medication for symptoms as they arise, and chiefly when complications cause severe pain or distress. Lastly, a wise physician, gifted with common sense and understanding. These principles of treatment will, doubtless be required as adjuncts of the greatest specific that the world may yet find.—*Research Problems in Tuberculosis, E. R. Baldwin, Boston M. and S. J., January 24, 1918, clxxviii, No. 4, 105.*

The Fight Against Tuberculosis.—Danysz explains the mechanism of infection by the tubercle bacilli as it differs from other infections. He shows how the special phase of production of antibodies which, in diphtheria, corresponds to immunization and the cure of the disease, in tuberculosis corresponds to the beginning of the pathologic state. In diphtheria, it is the excess of toxins, in tuberculosis, the excess of antibodies within the cells which determines the pathologic moment and the lesions. He presents evidence further demonstrating that a certain relative immunity can be realized by bacteriovaccination. This, in connection with the spontaneous cures in certain cases, suggests that it may yet be possible to cure the disease with a combination of vaccination and chemotherapy. But scattered experiences and experiments do not afford an adequate basis for determining the best technic for both. This is a task too vast to be left to isolated establishments. To date, the hospitals, the sanatoriums have not been able to keep the tuberculous long enough and control the results with uniform methods. To realize appreciable progress, experimental and clinical experts must be grouped in establishments for study and cure of tuberculosis, the whole work systematized and endowed, so that every discovery, old or new, can be given a thorough test for its clinical value, under the best conditions for control. These studies will be necessarily long and expensive, but they will prove less expensive in the long run than the present haphazard methods in scattered clinics, etc., without any general direction. We know now that it is possible to render the organism more resistant to contagion, and the task before us is to utilize better the clinical and experimental data already acquired, and to organize new research to clear up certain still obscure points. The services of bacteriologists, chemists, physicians and veterinarians should be organized and correlated, carrying on parallel the study of tuberculosis in both man and cattle.—*La lutte contre la tuberculose, T. Danysz, Presse méd., August 30, 1917, xxv, No. 48.*

Civilization and Tuberculosis.—Civilization and tuberculosis like civilization and syphilis seem to go hand in hand. This is especially seen in the case of the Indian and the negro. These races were virtually free from tuberculosis until they came in contact with civilization. Civilization is responsible for much if not all of the tuberculosis. The vast majority of urban people have had at some time or other a tuberculous infection.

Many and widespread are the causes responsible for tuberculosis in the present status of civilization. Migration from the country to the city, from a relatively quiet life to the strenuous city life, adds to the predisposition. Poor factory hygiene with long hours of work under insufficient ventilation, is one of the most important indirect causes of tuberculosis, due primarily to the deterioration of health induced thereby. Living in unsanitary tenement houses, intemperance, syphilis, lack of proper nutrition, and child labor are among the most potent factors.

Children born of tuberculous, luetic, or alcoholic parents have the disadvantage of hereditary constitutional weakness, an added predisposition to tuberculosis. What chance has a poor, tuberculous mother when pregnant? Surely, she is doomed.

The age at which a tuberculous infection contracted in infancy or childhood usually becomes active is at or after 15 years. The cause for this is child labor, which entails an excessive physical strain on the delicate growing organism. Long and strenuous school work may be reasonably included in child labor.

Another reason for the large morbidity, and mortality from tuberculosis among children, poor and well to do, is the inability of the poor mother, because of her work in the factory, to nurse the infant herself, and the disinclination of the rich mother, because of her social duties, to give the breast to her baby.

Inhalation of vegetable and mineral dust in trades and industries, is a source of irritation of the mucous membrane of the respiratory tract, which predisposes to tuberculosis.

There is also much tuberculosis among the rural population, due not so much to overwork as to the unhygienic way of living in the home and at school.

The same civilization that favors the spread of the white plague, has, however, also devised ways and means of combating this dread disease. Tuberculosis can be prevented, can be cured, and be eradicated by true, altruistic civilization.

Many are the ways to combat tuberculosis. Periodic physical examinations of the men in the different trades and in commerce should be made, to weed out the tuberculous and pick out those predisposed. Dust in all its forms should be prevented. Dust collectors and proper factory sanitation are essential. Before a building is torn down it should be thoroughly wetted to minimize the dust produced. Carpet beating should not be allowed, the carpet should be cleaned by the vacuum process. Glass should not be thrown in the streets, as the glass particles are irritating to the respiratory tract. Ash and garbage cans should be tightly closed.

The people should be enlightened on the subject of tuberculosis by adequate antituberculous propaganda and education. Tuberculous parents should not procreate; breast feeding should be encouraged; child labor done away with, and a modified Gary system instituted for the education of children. There should be sanitary supervision of tenement and lodging houses. Migration to the country should be encouraged by making farm life more agreeable and profitable. Finally there should be compulsory insurance for working people.

The present war has greatly increased the morbidity of tuberculosis. For the care of these and the civilian population hospitals and sanatoria should be established. Those of the drafted men who have been rejected should be formed into a reserve army for agricultural work. At the end of 6 to 12 months many of these will be fit for active service. The United States should learn from the mistakes made by the European nations in the care of the health of the soldiers.—*The Effects of Civilization on the Morbidity and Mortality of Tuberculosis, S. A. Knopf, Med. Rec., July 21, 1917, xcii, No. 3, 94.*

Prevalence of Tuberculous Lesions in Cadavers.—Reinhart writes from Berne where for eighteen months he made a special study of all the cadavers (460) at the Pathological Institute, seeking for evidences of tuberculosis. No traces of tuberculosis were found in the 28 newborn infant cadavers, but 29.16 per cent of 72 children under sixteen had manifest tuberculosis, in a progressive stage in all, although only 16.8 per cent had died from it. He cites statistics from other large cities, showing from 10 to 42 per cent with tuberculosis in the child cadavers, the numbers reported on varying from 88 to 848. Rinehart's material confirms the increasing prevalence as the children grow older, only 7.14 per cent showing tuberculosis under 1 year. In the adult cadavers, tuberculous lesions were found in 96.38 per cent of the total 360. Only in 13 was the search negative, and of these, 9 were under thirty. Other statistics show a range from Beitzke's 51.4 per cent (Berlin), to Naegeli's 98 per cent (Zurich). The tuberculosis mortality was highest between thirty and forty, rapidly declining after this age. In 63.9 per cent of the adult cadavers the tuberculous lesions were in a clinically healed stage, the proportion of these cases increasing with each decade. He does not include small induration of the apex among the positive findings but he was impressed with the frequent, coincidence of these indurations with calcified foci in the bronchial glands on that side. This coincidence was marked in 122 of 230 cadavers. This percentage of 63.9 healed cases is the largest yet published, he thinks. The difference between town and country dwellers was slight, 93.9 per cent of the 140 town people and 98.1 per cent of the 211 country dwellers. The tuberculous mortality rate was slightly higher for the latter 2737. in comparison to 22.15 per cent, but the proportion of active progressive cases was only 7.5 per cent in the country people to 14.9 per cent in the towns. The data presented confirm the wide prevalence of the disease and its tendency to healing. The data show further that it is doubtful, to say the least, whether tuberculous infection occurs generally before the twentieth year.—*Anatomische Untersuchungen über die Haeufigkeit der Tuberkulose, A. Reinhart, Corr. Bl. f. Schw. Aerzte, September 8, 1917, xlvii, No. 36, 1153.*

Tuberculosis and Paroxysmal Thyroid Insufficiency.—Albina's patient was a girl of 14 who had been menstruating for eight months. Each menstrual period was preceded by a day of subfebrile temperature, sweating and persisting pains in some of the joints. They swelled and were tender but there was no edema in the region nor atrophy of muscle tissue. All these disturbances subsided with the menses; during the intervals there was no pain or fever. The findings at one apex were suspicious of tuberculosis, and the general aspect suggested defective thyroid functioning. The lack of any benefit from the salicylates suggested that the joint troubles were of toxic origin. The diagnosis of rheumatism from thyroid insufficiency on a tuberculous soil was sustained by treatment on this

assumption. Under thyroid treatment the menses returned to normal, without joint disturbances and without fever. The thyroid treatment was then stopped and treatment for incipient tuberculosis was pushed. After ten months of this the patient was restored to clinical health, with no return of pains or fever after the first month. The writer began treatment by giving sodium bicarbonate freely for three days and then thyroid treatment for three weeks in increasing doses.—*Tuberculosis e hypotiroidismso paroxistico (un caso de reumatismo tiroideo y menstruacion febril). A. Eusebio, Rev. de la Asoc. Méd. Argent., July, 1917, xxvi, No. 152, 967.*

Tuberculosis at Different Ages.—In very early life tuberculosis runs a very acute course, assuming a more subacute course in the middle of child life, and becoming more chronic and benign towards puberty. At this latter period the organs and tissues of the greater circulation, which, up to now were most vulnerable, become less so. The organs of the lesser circulation, the lungs, are chiefly affected, in the second decade, and this involvement assumes now, as in the beginning of the first, a very malignant form. Toward and during the third decade it is subacute, in the fourth and after that, chronic, or again more benign. Late in life it may occasionally assume the acute form. We may then say that the disease can attack the individual at any age and may assume any form, while attacking any tissues. In young life, the major circulation and the tissues supplied by it are affected and metastases take place in bones, joints, meninges, and glands through the blood and lymph stream. In later life, the lungs and the lesser circulation are attacked and spreading takes place by continuity; to the larynx from the lungs, to the abdominal organs from swallowed bacilli. In children abdominal tuberculosis is the result of the ingestion of milk containing bovine tubercle bacilli.—*The Course of the Tuberculous Disease at Different Ages, John Ritter, Ill. Med. J., December, 1917.*

On Tuberculosis in Children.—In a ward of nursing babies a large number of positive reactions took place upon the occasion of a general test with tuberculin. A carefully carried out investigation showed that the epidemic was due to a nurse who was in an advanced stage of pulmonary tuberculosis and who had hidden her disease. The tuberculin test was positive in all the children of this service with the exception of two babies who were breast fed by their mothers. In a series of babies in a ward where this particular nurse had only temporarily substituted, 33 per cent of the subjects were infected. Finally, in a third series where she had given her care for only the briefest period only one baby presented a positive reaction.

The conclusions are somewhat guarded. In view of the ignorance in which we now stand as far as the real genesis of the symptoms is concerned, it would be premature to assign to them a precise signification. The success in the way of cures from tuberculin, which result in the disappearance of the reaction, keeps one from looking upon it as an indication of organic defense. Cutireaction is rather more an indication of the defensive combat itself than of an organic capacity for the combat. The author does not even admit the current opinion that infantile tuberculosis is a sort of vaccination for adult life, because were it so the class of people in easy circumstances which is relatively free from infantile scrofulosis should furnish a greater contingent of tuberculosis in the adult, which is far from being the case.—*Ueber Tuberkulose, E. Schloss, Berl. Klin. Wchnschr., November 26, and December 3, 1917.*

Tuberculosis in Children.—From the second to the sixth year of life tuberculosis is apt to affect the bones, cartilage or lymph glands. From the age of 6 to 15 children are quite free from serious tuberculous disease but they have the infection as shown by the skin tests. The so called tuberculous infection of children as distinguished from disease is a misnomer, the author's belief being that the disease is active in the bronchial glands and that at that time the child is having the fight for his life. This condition is frequently attended with exacerbations due to a recurrent bronchial adenitis. Infiltration of the bronchial glands is the cause of the higher pitched expiration heard in the right apex, there being more glands around the right main bronchus. A child free from bronchial adenitis will have the same pitched expiration over both apices. Tonsils and lymphnodes are a protection against tuberculosis and should not be removed unless badly diseased.—*Tuberculosis in Children, G. H. Cattermole, Northwest Med., December, 1917, xvi, No. 12, 362.*

Frequency of Miliary Tuberculosis in Old Age.—Braun gives figures from the Pathological Department of the Basle University which show that over 14 per cent of all cases of miliary tuberculosis were present in cadavers of subjects above the age of 60 years. This refers only to acute

general miliary tuberculosis which must necessarily have developed late in life and have been the essential cause of death. The lungs were involved in practically every case, a fact previously noted in connection with this affection, and due to the fact that the bacillus enters the circulation through the venous system and encounters the lungs immediately through the lesser circulation. In old age it is even more apt to be arrested here than in earlier years. Next to the lungs in frequency the kidneys, spleen and liver are involved to a greater or less degree, and in a good majority of cases. The meninges are but rarely attacked—in about 10 per cent—in direct contrast with the frequency of this participation in youth. The choroid shows an even greater degree of immunity; in fact, save for the lungs and other viscera first mentioned all the tissues show more or less immunity. The mechanism of the infection is not readily apparent. Old foci were found in lymph nodes, lung tissue and other localities, and in about one-half of the cases a solitary focus of old tuberculosis could be held responsible. In the remainder there was more than one focus involved in the process. Vascular lesions, usually occurring in these cases as responsible for general infection, are not mentioned (save for a certain number of cases in which the thoracic duct was primarily involved). In explanation it should be stated that the autopsy material goes back to 1872, so that for many years vascular tuberculosis was not looked for. In its absence we can only attribute the majority of the cases to old lesions in the lungs and lymph nodes. The diagnosis of acute general miliary tuberculosis in old age is very difficult to make. Paradoxical cases of bronchitis and bronchopneumonia with signs of heart failure doubtless usually conceal its presence.—*Die Haeufigkeit der Miliartuberkulose im Greisenalter, E. Braun, Corr. Bl. f. Schw. Aerzte, September 8, 1917, xlvii, No. 35, 1121.*

Is There a Closed Type of Tuberculosis in Evolution?—Richet Jr. believes that pulmonary tuberculosis in evolution is always "open," from the very outset, and that the sputum always contains bacilli, and is contagious. The general belief is that in a large fraction of cases of clinical tuberculosis the sputum is bacillus-free, because the foci are "closed." Opponents of this belief have not been numerous, but of late some notable authorities have reached the opposite conclusion—Bezançon and de Jong and Rist for examples. This does not mean, perhaps, that the sputum is never free from bacilli, and in any case it is often necessary to use technical refinements to reveal their presence. One-slide tests are utterly untrustworthy. When a number of smears are made some of them will be negative. With physical signs of apex tuberculosis the first question relates to age. Is the focus old and stationary or recent and progressive? If the latter is the case, bacilli will practically always be found in the sputum. On the other hand, physical exploration may be negative throughout and yet there may be sputum containing the bacillus. A case is cited of a man who exhibited all the phenomena of healed tuberculosis, including absence of bacilli in the sputum. A week later a second sputum test made with all refinements of technique proved positive much to the surprise of the medical staff. In another case the same sequence was present, with a single bacillus in the smear. Further tests, however, were negative, coinciding with disappearance of expectoration. Cases of this type are not uncommon and tend to show the limited value of negative finds. If, however, the latter persist, we may feel sure that the patient is improving. A certain number of negative finds has the same value as a single positive find. The fetish of a closed progressive tuberculosis of the lungs has come about perhaps from our knowledge of lymph node and bone tuberculosis, for here the surgeon, speaking surgically, can properly speak of open and closed lesions. There is no warrant at all to transfer this dichotomy to pulmonary lesions.—*La tuberculose pulmonaire évolutive, dite fermeé, existe-t-elle? Richet, Presse med., September 6, 1917, No. 49, 508.*

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of American Review of Tuberculosis published monthly at Baltimore, Md. for Apr. 1, 1918

STATE OF NEW YORK } ss.
COUNTY OF NEW YORK }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Philip P. Jacob, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the American Review of Tuberculosis and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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* "The Choice of Tuberculins," by Benjamin White, Otisville, N. Y., Department of Health, City of New York. Read at the annual meeting of the Medical Society of the State of New York, at Saratoga Springs, May 18, 1916.

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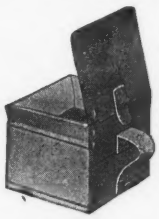

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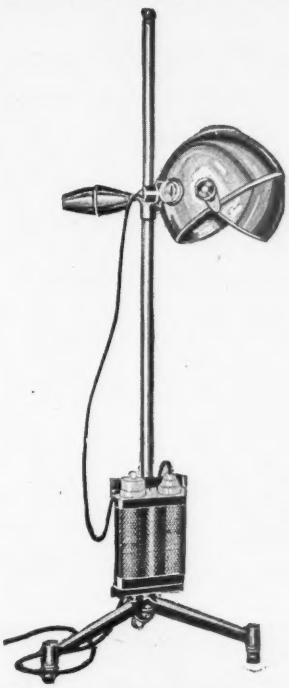

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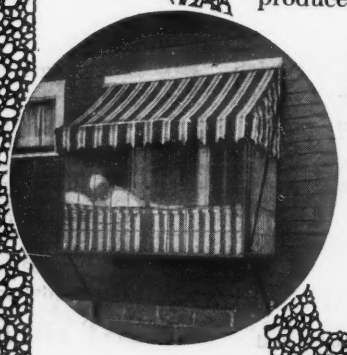

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